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CONTENTS

b) SPECIAL

THE INTERNATIONAL MOVEMENT OF FERTILIZERS.

September 1, 1914.

INTRODUCTION.

This review is the first number of a half-yearly periodical whose publication was decided upon at the last General Assembly held at the Institute (Inst. int. d'agr., 4ème Ass. gén., Décis. II, Rapport Pioda-Laur, p. 3). The general plan of the review was established by the Permanent Committee; it will appear regularly in the official (French) edition on March 1st and September 1st, that is to say at those times of year when purchases are being made by consumers, and will form a continuation to *Production et consommation des engrais chimiques dans le monde*, already published by this Institute.

As regards the products to be considered, the scheme laid down in the above publication has been adhered to and the fertilizers limited to the following categories :

1. *Phosphatic fertilizers :* mineral phosphates, basic slag, superphosphates, guanos, bones.
2. *Potassic fertilizers :* Stassfurt salts, other potassic fertilizers.
3. *Nitrogenous fertilizers :* nitrate of soda, sulphate of ammonia, synthetic fertilizers, organic fertilizers.

In consideration of the similarity of their market conditions, st and copper sulphate have been included in the Review as other pro useful to agriculture.

The Review comprises five parts: production, imports and ex consumption, prices, bibliography.

The figures given refer as far as possible to the whole year 1913 a the first half-year of 1914; those referring to 1912 have also been repro for comparison. Prices are those of the first half of 1914 and of for deliveries for the end of 1914 (1). The next number of the review, to a on March 1, 1915, will contain final figures for 1913, and as far as possi those for 1914, while prices will refer to the second half of 1914 and o ward deliveries for the beginning of 1915.

Production. — Each fertilizer forming a different category is tabu according to its production in the different countries.

Imports and exports. — The principal products which are clas under separate headings in official returns are each tabulated to show commercial movement in the different countries; an official state of the international situation is thus obtained.

Consumption. — A few figures obtained by the Institute will be lished under this heading; statistical information on this point is difficult to obtain and should form the object of future development

Prices. — Wholesale market prices from certain important mar are selected for reproduction and where necessary a distinction wil drawn between nominal quotations and actual selling price. This of the Review will be further developed as time goes on in order tha should prove of the greatest possible practical value.

Prices of mineral phosphates are given both in America and c. i. f Europe. Potash salts are quoted at the German official prices and New York, the latter as representative of the most important independ market.

Official quotations from the principal markets are compared for trate of soda, sulphate of ammonia and synthetic manures during the six months of 1914, the figures referring to prices at the end of each mon

Bibliography. — Discoveries of new beds or the adoption of new m nufacturing processes for dealing with chemical products used in agri ture will be notified in this part of the Review, as well as new methods applying such products or legislative measures in connection with them.

(1) Quotations for forward deliveries have become invalid owing to the pres national situation.

WORLD'S PRODUCTION OF FERTILIZERS
ND OF CHEMICAL SUBSTANCES FOR AGRICULTURAL USE.

Phosphatic Fertilizers.

I. — World's Production of Natural Phosphates.

Country	1912	1913	1st half-year 1914
	metric tons (1)	metric tons	metric tons
a) *Phosphorites:*			
ed States of America	3 231 636	3 202 636	.....
is	2 057 498	2 284 678	.....
ria	377 601	438 601	239 690
ce	330 000	335 000	.....
stmas Island	159 512	152 405	.....
an and Nauru Islands	300 000	.....	.....
ium	203 100	.....	.....
pt	69 958	64 138	.....
aur (Palau Islands)	60 000	90 000	60 000
atea (Tuamotu Islands)	40 000	.....	.....
ch West Indies	20 362	.....	.....
sia	25 000	25 000	.....
th Australia	6 198	.....	.....
ch Guiana	.....	.....	.....
in	.....	.....	.....
an	7 879	8 000	.....
b) *Apatites:*			
den	.....	.....	.....
way	.....	.....	.....
ada	164	.....	.....
Total	6 888 908	(6 600 458)	.....

The figures for the United States refer to amounts mined; amounts were 3 146 573 m. tons in 1912 and 3 020 905 m. tons in 1913. The res for Tunis also refer to amounts mined, while amounts despatched e 1 923 007 m. tons in 1912 and 1 984 880 m. tons in 1913. The figures Algeria on the other hand refer to exports and should be increased by amount consumed internally for the manufacture of superphosphate, ich is in part exported (see Part 2, table III, p. 1111).

(1) Metric ton = 0.9931 long ton.

II. — World's Production of Basis Slag.

Country	1912	1913	1st half-y 1914
	metric tons	metric tons	metric to
Germany	2 110 000	(2 200 000)	.....
France	679 000	(700 000)	.....
Belgium	534 000	(500 000)	.....
United Kingdom	400 000	404 000	.....
Luxemburg	253 000	(250 000)	.....
Austria-Hungary	92 000	(100 000)	.....
Italy	20 000	20 000	.....
Russia	16 000	32 000	.....
Sweden	15 000	(15 000)	.....
Other countries	(25 000)	(25 000)	.....
Total...	4 144 000	(4 246 000)	.....

Potassic Fertilizers.

With regard to the Stassfurt potash salts, figures are given which hav been supplied by the German Potash Syndicate and it should be noted tha these differ slightly from those published later by the German Imperia Office of Statistics (see *Vierteljahrshefte zur Statistik des Deutschen Reichs*).

III. — Production of Potash Salts in Germany.

Nature of salts	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons
a) *Crude salts*:			
nallite and kieserite	5 281 642.7	5 302 350.5	.....
hite (ncluding hartsalz and shœnite) and ylvinite	5 788 371.6	6 305 160.0	.....
Total.....	11 070 014.3	11 607 510.5	.....
b) *Treated salts*:			
ride of potash 80 %	471 434.6	484 254.1	.....
hate of potash 90 %	115 728.4	110 783.6	.....
hate of potash-magnesia calcined 48 %	55 987.2	58 269.1	.....
sh manure salts 20, 30, 40 %	723 257.4	906 212.4	.....
sh manure salts 38 %	48 059.0	50 393.4	.....
hate of potash-magnesia, crystal-ed 40 %	172.5	119.4	.....
crite in lumps	45 492.4	36 708.2	.....
crite, calcined and ground	1 070.3	1 165.8	.....
Total.....	1 461 201.8	1 647 906.0	.....

IV. — Total Amounts of Potash Salts sold for Agricultural and Industrial Purposes (*as* K_2O).

Destination	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons
a) *For agricultural purposes*:			
any	463 383.6	536 102.6	.....
countries	440 375.4	467 810.6	.....
Total.....	903 759.0	1 003 913.2	.....
b) *For industrial purposes*:			
any	65 181.4	68 180.2	.....
countries	40 278.3	38 276.0	.....
Total.....	105 459.7	106 456.2	.....
Grand total.....	1 009 218.7	1 110 369.4	.....

Nitrogenous Fertilizers.

V. — General Movement of Chilean Nitrate.

Movement	1912	1913	1st half-y (up to May 1914
	metric tons	metric tons	metric to
Production	2 773 459	2 586 975	1 214
Export	2 739 530	2 494 166	1 016
Consignments for consumption	2 556 973	2 530 645	1 765
Visible stocks (Dec. 31)	1 765 867	1 620 056	1 205 (May

VI. — World's Production of Sulphate of Ammonia.

Country	1912	1913	1st half-ye 1914
	metric tons	metric tons	metric ton
Germany	492 000	549 000	.....
United Kingdon	394 500	425 700	.....
United States	149 700	176 900	.....
France	69 000	75 000	.....
Belgium	43 700	48 600	.....
Austria-Hungary	35 500	39 000	.....
Italy	11 100	15 000	1
Spain	12 000	15 000	.....
Netherlands	6 000	6 000	.....
Russia	4 000	8 000	.....
Japan	7 300	8 000	.....
Australia	3 000	3 000	.....
Denmark	2 400	2 800	.....
Sweden	1 400	1 400	.....
Other countries	(75 000)	(75 000)	.....
Total	(1 306 600)	(1 448 400)	.....

The figures for the United Kingdom refer to the total amount of ammonia produced stated as sulphate ; according to the Board of Trade the ...ate of ammonia actually produced would only be a little over 84.34 ...ent. of these figures. The amount of ammonia produced in Italy ... first half-year of 1914 refers only to sulphate formed by the conver... ...f calcium cyanamide.

VII. — WORLD'S PRODUCTION OF CALCIUM CYANAMIDE.

Country	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons
ny.....	(25 000)	(25 000)	.....
-Hungary.....	5 000	(7 500)	.....
States and Canada.....	(14 000)	(14 000)	.....
.....	(7 500)	(7 500)	.....
.....	10 304	14 982	12 000
.....	5 199	(7 500	.....
y.....	13 892	22 111	.....
n.....	6 043	(8 000	.....
rland.....	(7 500)	(7 500)	.....
Total.....	(94 438)	(114 093)	.....

Figures in brackets represent the productive capacity of the factories: ...s represent the actual production.

VIII. — MOVEMENT OF NORWEGIAN NITRATE OF LIME.

	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons
d production.....	.....	70 000	35 000
.....	51 701	70 171	.....

Other Chemical Products for Agricultural Use.

IX. — World's Production of Crude Sulphur.

Country	1912	1913	1st half-ye 1914
	metric tons	metric tons	metric ton
Sicily	356 531	345 349	159 2
	10 000	10 000	.....
Other Italian regions	37 497	37 839	.....
Italy (total)	404 028	393 188	.....
United States	308 328	316 575	.....
Japan	54 256	49 131	.....
Other countries	(50 000)	(50 000)	.....
Total...	816 612	808 894	.....

According to information from the "Consorzio solferino siciliano" the production in Sicily is made up of the amounts conveyed to exporting ports together with the internal consumption, which is estimated as 10 00 metric tons.

X. — World's Production of Sulphate of Copper.

Country	1912	1913	1st half-ye 1914
	metric tons	metric tons	metric ton
United Kingdom	85 500	76 843	63
Italy	52 312	29 217	.....
United States	17 908	24 643	.....
France	26 000	26 000	.....
Austria-Hungary	15 200	15 400	.....
Germany	5 942	5 682	.....
Other countries (Sweden, etc.)	1 000	1 000	.....
Total...	203 862	178 785	.....

The figures given for the United Kingdom are those of exports, which are approximately equal to the production. For Ireland the following figures have been obtained:

	Imports		Exports	
1912	2 899	metric tons	14.2	metric tons
1913	4 780	„	3	„

INTERNATIONAL TRADE.

The data given below are drawn from the customs returns of imports l exports for each country and represent what is commonly termed the cial trade of imports and exports (see: Inst. Int. d'Agr., Publications Bureau de la Statistique Générale, No. 4, *Notes sur les Statistiques du mmerce extérieur dans les différents pays*, 1914). Tl e figures referring to ilar or almost similar classes of material in the returns have been col- ted into tables with various headings, qualifying notes being made where essary.

The fiscal year in Canada ending in March, the figures for the two rs ending in March 1913 and 1914 are given under 1912 and 1913 re- ctively. The same applies to British India.

Phosphatic Manures.

I. — IMPORTS AND EXPORTS OF NATURAL PHOSPHATES.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
any	902 824	928 798	420 165	7 032	6 885	732
ia-Hungary	175 831	212 003	128 180	.....	.....	.....
um	244 221	244 765	113 668	22 916	18 158	10 988
ark	45 710	55 875	.....	.....	.....	.....
t	.....	.....	.....	52 115	64 183	.....
	176 183	254 463	.....	.....	.....	.....
d States	.....	.....	.....	1 225 824	1 388 362	.....
e	907 845	934 679	472 554	22 062	21 128	7 997
a	.....	.....	.....	377 601	438 601	239 690
	1 910 198	.....	.....	.....	.....	.....
Britain	528 591	547 640	279 544	4 492	11 808	26 466
d	.....	162 599	.....	.....	943	.....
alia	12 509	8 406	.....	.....	190	.....
a	.....	691	.....	.....	.....	.....
of South Africa	466 144	529 776	.....	1 285	4 171	.....
	286 984	333 916	.....	.....	.....	.....
y	.....	.....	.....	1	.....	.....
rlands	60 161	.....	.....	5 708	.....	.....
	47 421	.....	.....	.....	.....	.....
n	81 574	110 450	.....	.....	.....	.....
rland	17 821	18 885	.....	.....	.....	.....

II. — Imports and Exports of Basic Slag.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half 191
	metric tons	metric tons	metric tons	metric tons	metric tons	metric
Germany	372 835	441 069	234 081	663 024	713 878	307
Austria-Hungary	203 536	212 788	110 153	3 607	2 007	
Belgium	130 439	144 553	76 248	550 847	685 907	335
Denmark	9 948	8 957	.....	.....	.....	.....
France	59 870	41 010	17 933	248 840	246 271	95
	—	—	663 643	—	—	2 312
Great Britain Ireland	50 102	51 951	13 450	159 689	167 742	70
Canada fr.	47 899	33 042	.....	.....	.....	.....
Union of South Africa	.....	5 416	.....	.....	.....	.....
Italy	118 190	119 257	4 727	14	103	.....
Japan	245	17	.....	.....	.....	.....
Norway	40 257	34 492	.....	.....	.....	.....
Netherlands	339 968	.....	.....	154 483	.....	.....
Russia	170 340	.....	.....	.....	.....	.....
Sweden	21 047	19 243	.....	.....	.....	.....
Switzerland	54 182	55 793	.....	.....	.....	.....

The first set of figures for France are those given under the heading of " machefer " in the returns ; when ground, the same material was entered under the heading " engrais chimique " till the end of 1913, so that the figures only referred to a portion of the trade in slag ; for the first half of 1914 the imports and exports of ground slag are given separately in the second set of figures.

III. — Imports and Exports of Superphosphate.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
ny ...	62 399	53 193	29 225	271 349	282 653	192 145
a-Hungary	79 531	75 224	43 993	5 354	3 748	1 971
m	37 802	28 012	31 435	314 713	318 922	171 390
ark	102 135	110 155	.....	.....	.....	.....
	11 459	13 148	.....	.....	.....	.....
	161 047	149 602	.....	.....	.....	.....
e	89 059	100 822	55 768	169 617	145 236	72 001
a	28 183	18 164	1 284	3 329	8 006	.....
Britain	.....	.....	.....	90 314	64 496	28 534
d						
alia	.....	27 138	.....	.....	120 881	.....
la	878	966	.....	.....	.....	.....
of South Africa	.....	37 207	.....	.....	.....	.....
	254	977	.....	25 705	16 885	.....
o	.....	60	.....	.....	.....	.....
ay	8 543	4 283	.....	.....	.....	.....
rland	295 613	.....	.....	346 186	.....	.....
a	188 244	.....	.....	.....	.....	.....
en	9 815	.....	.....	57 807	36 037	.....

In many countries, such as Italy and certain colonies, where the use of ilizers is still very limited, superphosphate is included under the general ding of "chemical fertilizers" in the returns and therefore does not ear in t[1] above table.

IV. — Imports and Exports of Guano.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric
Germany	28 659	35 299	14 283	844	136	
	18 509	26 620	4 886	6 140	5 691	3
Argentine Republic	.....	.....	.....	24 078	28 630	.....
Belgium	15 166	49 541	11 099	31 697	29 446	14
Chile	509	.....	.....	.....	.....	.....
Spain	2 486	1 781	.....	.....	.....	.....
United States	19 467	19 411	.....	.....	.....	.....
France	311	1 376	.....	403	317	.....
Great Britain Ireland	14 341	25 957	14 857	.....	.....	.....
Australia	.....	1 362	.....	.....	317	.....
Canada	1 896	3 289	.....	.....	.....	.....
British India	13	93	.....	18 650	21 750	.....
New Zealand	13 574	.....	.....	.....	.....	.....
Union of South Africa	.....	318	.....	.....	.....	.....
Italy	195	111	12	.....	.....	.....
Norway	.....	.....	.....	10 693	13 063	.....
Netherlands	13 890	22 317	.....	11 046	10 968	.....
Sweden	187	.....	.....	454	.....	.....
Switzerland	112	72	.....	.....	.....	.....

The first set of figures for Germany refer to natural guano, the seco to artificial guano and similar products. The exports from the Argenti consist of meat guano, while those from British India, Norway and the gr ter part from Sweden are fish guano. South Africa, over and above official imports, received 6 993 and 4 830 metric tons of guano from t coastal islands during 1913 and the first half of 1914 respectively.

V. — Imports and Exports of Bones and Bone Manures.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
many	16 343	24 481	13 731	7 870	6 514	3 219
	36 842	30 845	11 035	28 925	32 474	19 335
ntine Republic	.....	.....	.....	30 451	30 716	.....
	.....	.....	.....	1 427	895	.....
ria-Hungary	13 336	7 080	.....	10 193	9 582	.....
ium	41 656	45 509	21 110	16 365	22 748	18 844
	.....	.....	.....	1 730	.....	.....
	.....	.....	.....	38	.....	.....
	.....	.....	.....	29 976	.....	.....
mark	120	.....	.....	34	.....	.....
ry	28	.....	.....	4 794	.....	.....
	.....	.....	.....	4 310	3 747	.....
d States	34 703	35 173	.....	.....	.....	.....
	38 095	36 768	22 444	10 973	.....	10 152
	892	2 627	381	977	499	476
	.....	.....	.....	1 656	1 774	.....
t Britain	41 862	41 336	20 002	.....	.....	.....
nd						
India	.....	.....	.....	.....	4 384	.....
	1 204	2 207	.....	9	3 311	.....
	3 839	3 890	.....	.....	.....	.....
India	52	.....	.....	111 984	107 100	.....
	.....	.....	.....	21	.....	.....
aland	10 677	.....	.....	13	.....	.....
of South Africa	.....	4 276	.....	.....	.....	.....
	.....	.....	.....	300	.....	.....
	4 193	5 630	2 115	3 630	7 028	3 642
	39 302	47 894	.....	.....	.....	.....
	.....	.....	.....	863	1 217	.....
	1 230	.....	.....	.....	.....	.....
	78	.....	.....	478	.....	.....
	4 475	.....	.....	283	.....	.....
y	.....	.....	.....	4 527	.....	.....
	.....	.....	.....	5 755	.....	.....

Where two sets of figures are given for any country, the first set refer aw bones and the second to treated bones, such as bone flour, bone ash, ined bones.

Potassic Fertilizers.

VI. — Imports and Exports of Potash Salts.

Country		Imports			Exports		
		1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
		metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	*a*	—	—	—	1 300 459	1 676 156	727...
	b	43	44	52	85 479	133 358	
	c	46	15	30	286 614	393 320	1
Austria-Hungary	*a*	97 721	110 069	54 330	1 572	1 774	
	b	13	19	6	800	1 474	
	.	5 280	5 216	1 889	855	1 317	
Chile	*a*	49	—	—	.....	.....	....
Denmark	*a*	25 887	24 667	—	.....	.....	....
United States	*a*	694 133	600 168	—	.....	.....	....
	b	44 071	40 172	—	.....	.....	....
	c	218 751	217 191	11 335	620	708	
France	*b*	17 805	11 284	30 006	271	134	
	c	45 174	46 137	—	.....	.....	....
Ireland	*a*	19 313	17 781	—	.....	.....	....
	b	442	414	—	.....	.....	....
	c	1 204	1 173	—	.....	.....	....
Canada	*a*	19	180	—	.....	.....	....
	b	4 781	6 957	—	.....	.....	....
Union of South Africa	*a*	—	1 812	—	.....	.....	....
Greece	*c*	276	—	—	.....	.....	....
Italy	*b*	13 466	9 839	2 059	2.5	0.7	....
	c	8 153	7 154	3 246	0.1	.....	
Japan	*a*	81	—	50	.....	.....	....
Mexico	*b*	—	10	50	.....	.....	....
	c	—	81	—	.....	.....	....
Norway	*a*	21 304	21 084	—	.....	.....	....
Russia	*a*	83 131	—	—	.....	.....	....
	c	5 995	—	—	.....	.....	....
Sweden	*a*	85 776	80 253	—	.....	.....	....
Switzerland	*a*	15 006	13 241	—	.....	.....	....
	c	1 572	1 572	—	.....	.....	....

The sets of figures classified as *a* refer to substances designated as otash manure salts"; those under *b* to substances designated as "sul-te of potash"; those under *c* to substances designated as "muriate otash". This classification is not, however, always very exact; for nple in Italy kainite and other manure salts are included under *b*. exports for Germany for 1913 are rather high, as they include a of those for 1912.

The only potassic fertilizer classified separately in the United Kingdom trate of potash (see Part 2, Table VIII, p. 1116) the rest are returned er the heading of unenumerated manures.

VII. — IMPORTS AND EXPORTS OF OTHER POTASH MANURES.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
any	597	402	276	14 450	16 058	7 551
	86	.....	.....	.....	.....	.....
	3 886	.....	.....	.....	.....	.....
e	53	71	291	952	708	412
	1 293	3 597	1 400	3 719	1 586	1 559
Britain	11 034	12 084	6 273	1 935	1 723	74
d						
la	840	938	.....	.....	.....	.....
(barrel-)	.....	.....	.....	550	434	.....
h India	3	.....	.....	15 076	13 618	.....
Zealand	998	.....	.....	.....	.....	.....
e	2 576	.....	.....	.....	.....	.....
	461	458	209	3	6	.....
	.....	10	.....	.....	.....	.....
	418	522	.....	.....	.....	.....
ay	.....	.....	.....	1 784	2 521	.....
	.....	.....	.....	32 844	32 796	.....
	.....	.....	.....	7 000	53 047	.....
rlands	4 312	6 721	.....	7 407	6 243	.....
	352	.....	.....	.....	.....	.....
n	.....	.....	.....	34 643	37 655	.....

The product referred to in this table is nitrate of potash except in th following cases :

1. The second set of figures for France, which refer to ha potash.
2. The second set of figures for Canada which refer to wood ashes.
3. ,, ,, ,, ,, ,, Norway ,, ,, kelp ash.
4. The third ,, ,, ,, ,, ,, ,, felspar.
5. The fourth ,, ,, ,, ,, ,, ,, ground felspa
6. The single ,, ,, ,, Sweden ,, ,, felspar.

Nitrogenous Manures.

VIII. — IMPORTS AND EXPORTS OF NITRATE OF SODA.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-ye 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric to
Germany	812 898	774 299	589 854	27 431	27 557	23
Argentine Republic	373	649	.....	.....	.....	.....
Austria-Hungary	92 838	93 025	62 733	403	313	
Belgium	235 382	304 136	164 598	122 668	13 999	88
Chile	.....	.....	.....	2 498 529	.....	.....
Denmark	36 402	35 024	.....	.....	.....	.....
Egypt	56 047	56 474	.....	.....	.....	.....
Spain	46 715	35 557	.....	.....	.....	.....
United States	444 134	635 876	.....	.....	.....	.....
France	353 776	322 115	232 813	10 233	5 268	1
Great Britain, Ireland	125 557	143 181	66 822	.....	.....	.....
Australia	.....	3 393	.....	.....	516	.....
Canada	39 714	36 406	.....	.....	.....	.....
Union of South Africa	.....	66	.....	.....	.....	.....
Italy	54 654	67 418	58 405	27	50	
Japan	85 271	112 405	.....	.....	.....	.....
Norway	1 130	1 337	.....	184	811	.....
Netherlands	204 169	202 928	.....	129 763	121 096	.....
Russia	50 630	.....	.....	.....	.....	.....
Servia	135	.....	.....	.....	.....	.....
Sweden	35 107	33 892	.....	.....	.....	.....
Switzerland	3 162	3 328	.....	37	29	.....

The official figures given above do not agree with those published by Nitrate Association, which are based on commercial data and there- do not represent exactly exports and imports (see Bertrand, A., Cir- r No. 60 de la Asociacion Salitrera, p. 206).
For many countries no figures can be given as special returns for ite are not made, or are published with too great a delay.

IX. — IMPORTS AND EXPORTS OF SULPHATE OF AMMONIA.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
any	23 098	34 627	22 528	57 267	75 868	74 723
ia-Hungary	21	51	28	20 818	23 816	20 210
um	20 062	24 199	22 976	17 886	41 382	17 239
ark	.....	.....	.....	2 415	2 329	.....
t	651	1 650	.....	.....	.....	.....
d States	54 015	59 670	.....	.....	.....	.....
e	22 892	22 995	7 764	1 976	1 151	827
Britain, d	.....	.....	.....	289 512	328 223	167 075
alia	.....	792	.....	.....	2 340	.....
la	219	159	.....	.....	.....	.....
of South Africa	.....	362	.....	.....	.....	.....
	21 190	21 669	8 253	4	55	8
	93 416	26 938	.....	.....	.....	.....
	.....	63	19	.....	.....	.....
ay	.....	.....	.....	175	138	.....
rlands	39 275	.....	.....	31 317	.....	.....
	76	136	52	.....	.....	.....
n	46	.....	.....	41	.....	.....

This table is incomplete, especially with regard to imports in the nies. Such data may be found in the export returns of the United gdom, Belgium (Antwerp), Netherlands (Rotterdam), and now also hose of Germany which has started a considerable export trade to y, the Dutch Indies, etc. (see Inst. Int. d'Agr. *Production et Con- mation des Engrais Chimiques dans le Monde*).

X. — Imports and Exports of Synthetic Nitrogenous Fertilizer

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-ye 1914
	mteric tons	metric tons	metric tons	metric tons	metric tons	metric to
Germany	44 612	54 378	31 038	8 134	30 466	22 4
Denmark	412	5 066	.....	.....	.....	.....
Egypt	728	971	.....	.....	.....	.....
United States	2 339	.....	.....	.....	.....	.....
France	3 160	10 010	1 531	789	839	3
Algeria	766	1 091	458	.....	.....	.....
Canada	737	1 167	.....	.....	.....	.....
Mexico	.....	.....	2.5	.....	.....	.....
Norway	.....	.....	.....	4 270	7 807	.....
	.....	.....	.....	51 701	70 171	.....
	.....	.....	.....	13 892	22 111	.....
Sweden	8	.....	.....	.....	.....	.....
	176	.....	.....	0.4	.....	.....
	0.2	.....	.....	4 058	.....	.....

The imports of Egypt consist only of calcium cyanamide, those the United States only of nitrate of lime and those of Canada on of nitrate of ammonia, but the latter are probably not put to agricu tural use.

The first, second and third sets of figur s for Norway and Swed refer to nitrate of ammonia, nitrate of lime and calcium cyanami respectively. Figures for the exports of Norway during the first quart of 1914 are as follows:

2 771 metric tons of nitrate of ammonia
19 636 „ „ „ „ „ lime
9 838 „ „ „ calcium cyanamide.

EXPORTS AND IMPORTS OF ORGANIC NITROGENOUS FERTILIZERS.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
any	3 261	2 899	1 373	5 307	6 704	3 941
	57 930	64 421	35 636	12 022	15 781	9 866
tine Republic	.....	.....	.....	13 858	12 782	.....
a-Hungary	893	560	217	3 647	3 444	1 589
	1 237	1 667	963	777	654	388
	140 307	.....	.....	51 066	.....	.....
	.....	.....	.....	493 477	.....	.....
	.....	.....	.....	.....	75	.....
	.....	.....	.....	80 778	62 977	.....
	72 573	82 072	33 835	31 365	30 728	15 079
India	19	464	.....	164 380	178 126	.....
	623 471	373 800	.....	.....	.....	.....
	.....	.....	.....	14 548	8 929	.....
rland	145	136	.....	652	1 626	.....
	2 190	2 053	.....	1 354	1 579	.....
ay	.....	.....	.....	137 559	.....	.....

The first set of figures for Germany, Austria-Hungary and Switzer- refer exclusively to horns and hoofs for manurial use; the second efer to other animal residues, blood, etc. The figures for the Ar- ne Republic and Uruguay represent the total slaughterhouse residues ding meat guanos and bones, which are given elsewhere.

The exports and imports for China, Egypt and India consist entirely l cakes with the exception of a small export of other material from it shown in the first figure for 1913. Soya bean exports from China lassified separately in the second set of figures for 1912. It should oted that oil cakes are largely but by no means exclusively used anure in India.

Other Fertilizers and Chemical Products used in Agriculture.

XII. — IMPORTS AND EXPORTS OF UNENUMERATED CHEMICAL FERTILIZE

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-y 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric t
Argentine Republic	381	546	.....	.....	.....	.....
Chile	52	.....	.....	.....	.....	.....
China	49 647	.....	.....	.....	.....	.....
Egypt	61	245	.....	.....	.....	.....
United States	.....	.....	.....	75 780	73 911	.....
France	147 495	223 217	66 364	306 975	403 305	79
Algeria	9 493	10 291	.....	.....	.....	.....
Australia	.....	10 784	.....	.....	.....	.....
Canada fr.	279 806	312 060	.....	.....	.....	.....
British India	54 864	.....	.....	.....	.....	.....
Italy	37 032	71 729	15 372	9 243	19 310	140
Mexico	.....	80	75	.....	.....	.....
Servia	18	.....	.....	.....	.....	.....
Switzerland	25 926	26 309	.....	7 487	10 994	.....

The nature of the products varies with the different countries. France, up to 1914, they included ground basic slag. In Italy the great part of the superphosphate is included. In the United States the figu refer almost exclusively to compound manures exported more especial to other countries on the American continent (Canada, Mexico, etc.).

II. — IMPORTS AND EXPORTS OF OTHER UNCLASSIFIED MANURES.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
n.....	42 085	43 038	18 326	54 414	56 868	23 039
.....	287	.....	.....	14 721	.....	.....
.....	90 684	91 380	.....	14 143	24 869	.....
Britain.....	170 592	175 643	91 217	135 224	154 876	79 437
.....						
ha	.....	.....	.....	.....	12 077	.....
India.....	288	.....	.....	8 471	.....	.....
eland	78 782	.....	.....	112	.....	.....
of South Africa	.....	7 788	.....	.....	.....	.....
.....	656	.....	.....	.....	.....	.....
.....	19 640	12 651	10 416	19 977	28 670	1 692
.....	85 914	134 397	.....	36 628	27 391	.....
y	1 958	1 172	.....	.....	.....	.....
lands.....	1 579 332	1 635 566	.....	109 497	62 215	.....
.....	15 168	.....	.....	.....	.....	.....

This last class of manures is still more heterogenous. In Great Brin and Spain it includes potash salts, while the Netherlands include all zers except guano and nitrate of soda under the one heading in their hly returns, though further classifications occur in their annual re- . In Italy the figures refer exclusively to organic manures amongst 1 olive and wine pomace have recently assumed some importance.

XIV. — Imports and Exports of Sulphur.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric
Germany	42 284	46 737	29 772	1 746	3 472	2
Argentine Republic	4 549	3 125	.....	.....	.....	.....
Austria-Hungary	41 023	39 442	23 781	1 048	312	
Belgium	15 647	11 724	4 193	10 498	6 745	1
China	1 322	.....	.....	.....	.....	.....
Denmark	.....	268	.....	.....	.....	.....
Turkey	4 768	.....	.....	57	.....	.....
Egypt	643	600	.....	.....	.....	.....
Spain	6 565	11 202	.....	4	2	.....
United States	27 315	14 870	.....	5 865	9 065	.....
France	172 181	186 348	82 842	39 694	23 325	1
Algeria	26 105	31 991	30 013	.....	.....	.....
Great Britain, Ireland	22 098	18 505	9 081	1 856	731	.....
Canada	32 983	27 085	.....	.....	.....	.....
British India	5 841	6 428	.....	.....	.....	.....
New Zealand	2 034	.....	.....	.....	.....	.....
Greece	8 714	.....	.....	.....	.....	.....
Italy	184	183	74	351 339	376 387	194
Japan	.....	.....	.....	49 131	54 256	.....
Norway	13 911	14 607	.....	.....	.....	.....
Netherlands	35 324	36 937	.....	14 341	10 216	.....
Servia	71	.....	.....	.....	.....	.....
Switzerland	3 358	3 562	.....	.....	.....	.....
Sweden	38 471	38 192	.....	.....	.....	.....

Sulphur under all forms (crude or refined) is included in the al table. It is imported chiefly by the countries in which vine or fruit g ing is specially well developed.

XV. — Imports and Exports of Sulphate of Copper.

Country	Imports			Exports		
	1912	1913	1st half-year 1914	1912	1913	1st half-year 1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
ny	7 074	3 864	4 448	3 812	4 012	3 533
ntine Republic	1 376	1 288	.....	.....	.....	.....
a-Hungary	16 132	6 937	6 497	119	172	203
	221	.....	.....	.....	.....	.....
mark	.....	249	.....	.....	.....	.....
y	1 623	.....	.....	1.5	.....	.....
a	7 121	6 433	.....	1	2	.....
d States	.....	.....	.....	3 097	1 910	.....
ce	16 801	21 575	21 734	6 904	5 312	5 377
ra	4 612	3 609	3 687	.....	.....	.....
t Britain	.....	.....	.....	84 124	76 843	63 261
nd						
da	1 152	605	.....	.....	.....	.....
ce	2 524	.....	.....	.....	.....	.....
	36 568	30 450	21 491	1 387	522	1 504
a	883	.....	.....	.....	.....	.....
erland	2 873	2 103	.....	66	62	.....
den	.....	.....	.....	513	250	.....

The international trade in sulphate of copper is becoming important; product, like sulphur, is chiefly imported by those countries having e areas under fruit and vines.

THE CONSUMPTION OF FERTILIZERS IN THE DIFFERE COUNTRIES.

I. — MOVEMENT IN DENMARK DURING 1913 OF FERTILIZERS AND OTH CHEMICAL PRODUCTS FOR AGRICULTURAL USE.

Fertilizers	Imports	Exports	Consumptio
	metric tons	metric tons	metric ton
Phosphatic fertilizers.			
Mineral phosphates	55 875	.....	55 87
Superpho-phate	110 151	683	.....
Basic slag	8 944	.....	8 94
Bone flour	282	2	.....
Nitrogenous fertilizers.			
Synthetic products	5 066	.....	5 0
Nitrate of soda	34 930	.....	34 9
Sulphate of ammonia	524	2 830	.....
Potassic fertilizers.			
Kainite	9 400	.....	9 4
Others	16 700	.....	16 7
Lime, in lumps	5 079	2 085	.....
Lime, ground	1 411	3 357	.....
Marl	9 021	.....	.....
Manures from animal sources	85	105	.....
Sulphate of copper	249	.....	2
Sulphur	268	.....	2

The above data were collected by the Danish Office of the Inter tional Institute of Agriculture at Copenhagen.

II. — Consumption of Fertilizers in the United States during the years 1911-1913.

State	End of fiscal year	1911	1912	1913
		metric tons	metric tons	metric tons
...ama	Oct. 1	399 161	410 243	430 668
...ona	—	317	454	544
...ansas	Dec. 31	36 287	45 359	47 174
...lornia	June 30	45 087	45 359	32 659
...rado	—	2 268	2 722	3 175
...ecticut	April 30	40 823	43 545	45 359
...ware	Dec. 31	22 680	27 215	45 359
...ida	» »	166 411	170 485	193 891
...rgia	Sept. 30	1 091 091	1 001 409	1 016 676
...o	—	907	1 361	1 814
...ois	April 30	72 575	77 111	81 647
...ana	Oct. 15	163 147	130 342	175 902
...	April 30	1 814	2 268	3 175
...sas	Dec. 31	1 361	4 536	6 695
...tucky	» »	58 967	58 967	68 039
...siana	Aug. 31	82 631	68 542	89 610
...e	Dec. 31	127 006	136 078	145 150
...land	» »	143 335	145 150	153 314
...achusetts	» »	65 317	68 039	113 398
...igan	» »	40 823	46 266	52 603
...esota	» »	1 814	2 177	3 175
...issippi	Oct. 1	134 478	108 599	116 165
...uri	Dec. 31	37 816	34 799	54 431
...tana	—	544	635	726
...aska	—	272	454	907
...da	—	454	544	726
...Hampshire	April 30	17 236	19 958	22 680
...Jersey	Oct. 31	122 470	127 006	142 120
...Mexico	—	726	816	907
...York	Dec. 31	362 874	385 554	417 305
...Carolina	» 1	645 353	631 133	762 441
...Dakota	» 31	454	544	907
...	» »	134 263	137 696	167 829
...homa	April 30	7 257	9 072	16 329
...on	Aug. 31	2 722	3 175	4 082
...sylvania	Dec 31	285 763	289 134	308 443
...Rico	June 30	20 865	18 144	17 088
...e Island	March 31	10 886	13 608	16 329
...Carolina	June 30	951 461	803 967	833 101
...Dakota	July 1	181	272	635
...ssee	June 1	58 967	70 282	76 258
...	Sept. 1	48 067	40 823	68 492
...	Dec. 31	544	635	907
...ont	» »	18 144	19 958	22 680
...ha	» »	326 101	337 571	374 154
...ington	March 31	1 179	1 270	1 361
...Virginia	July 1	28 349	28 803	28 896
...nsin	Dec. 31	2 268	3 175	3 629
...ming	—	113	136	181
Total		5 783 636	5 575 392	6 169 736
...	June 30	...	9	41
...i	» »	...	63 500	60 000

...ates in which there are no fertilizer laws.

The above figures are furnished by the Agricultural Experiment Stati in the various States ; in the States where there are no fertilizer laws (n ked with an asterisk) the estimates are only approximative.

III. — IMPORTS OF MANURES INTO CEYLON DURING THE FISCAL YEAR 1912-1913 COMPARED WITH THOSE OF 1908.

Manure	1908			1912-13		
	Metric tons	Long tons	Price per long ton	Metric tons	Long tons	Pric per lo
			Rupees *			Rupe
Castor cake	7 082	6 971	56	4 257	4 190	68
Groundnut cake.....	—	—	—	15 877	15 627	87
Rape cake	—	—	—	1 510	1 486	49
Fish manure	74	73	57	21 058	20 726	57
Guano.....	10	10	120	3 720	3 661	98
Blood meal	—	—	—	2 653	2 611	171
Bone meal.....	4 789	4 714	55	6 750	6 644	85
Superphosphate	—	—	—	2 549	2 509	100
Basic slag	—	—	—	6 468	6 366	53
Sulphate of potash ..	55	54	166	5 163	5 082	145
Chloride of potash...	—	—	—	1 224	1 205	133
Kainit	—	—	—	1 651	1 625	51
Nitrate of potash ...	73	72	296	2 115	2 082	208
Refuse saltp. tre	292	287	200	—	—	—
Sulphate of ammonia	137	135	296	2 466	2 427	234
Nitrate of soda.*....	—	—	—	278	274	182
Other manures.....	459	452	167	4 163	4 097	165
Total...	12 972	12 768		81 902	80 612	

* 1 rupee = 1s 4d.

With a cultivated area of 2 800 000 acres (Statesman's Year-I 1914), the consumption of manure per acre is 54.5 lbs.

IV. — Consumption of Fertilizers in Australia.

	Metric tons	Long tons
outh Wales (1912)	39 541	38 918
a (1912)	95 514	94 010
land (1913)	10 368	10 205
Australia (1912)	93 073	91 607
n Australia (1912)	48 324	47 563
a (1912)	9 420	9 272
(1913)	8 890	8 750
Territory (1912)	851	838
Territory (1912)	1	1

le figures were received from the Department of Foreign Affairs, mwealth of Australia.

V. — Consumption of Fertilizers in Japan.

Manure	1911			1912		
	Metric tons	Long tons	Value in yen *	Metric tons	Long tons	Value in yen
sphate	266 992	262 788	7 672 105	424 003	417 326	11 721 277
"	1 078	1 061	44 639	3 622	3 565	107 078
	35 888	35 323	2 174 583	35 726	35 164	2 321 479
manures	1 089	1 072	64 498	1 331	1 310	72 168
of soda	32 257	31 749	4 575 018	41 673	41 017	5 860 553
of ammonia	11 383	11 204	1 126 376	7 737	7 615	798 720
nitrogenous ferti-	297	292	30 682	5 199	5 117	516 650
ed manures	208 469	205 186	14 308 988	237 880	234 134	16 862 526
anures			1 089 225			2 405 835

en = 2s 0¼d.

le figures were furnished by the Japanese Ministry of Agriculture and rce.

VI. — World's Consumption of Potassic Fertilizers for Agricultural Purposes (1).

Country	Potassic manures as K_2O in metric t	
	1912	1913
Germany	463 383.6	536 102
Belgium	10 945.2	13 182
Netherlands	39 473.7	43 478
France	31 690.8	33 124
England	12 958.9	12 958
Scotland	7 182.9	7 [illegible]
Ireland	3 272.6	3 [illegible]
Luxemburg	284.0	[illegible]
Austria	18 873.4	20 [illegible]
Hungary	3 736.4	4 [illegible]
Switzerland	3 500.9	3 [illegible]
Italy	7 295.9	6 [illegible]
Russia	23 420.0	22 [illegible]
Spain	9 009.2	8 [illegible]
Portugal	1 134.4	1 [illegible]
Sweden	20 670.0	19 [illegible]
Norway	3 431.0	3 [illegible]
Denmark	6 006.0	7 [illegible]
Finland	1 422.4	1 [illegible]
Balkan States	371.1	[illegible]
EUROPE	668 062.4	749 [illegible]
British India	812.4	1 [illegible]
Ceylon	3 210.9	2 [illegible]
Straits Settlements	65.2	[illegible]
Java	355.2	[illegible]
Sumatra	413.4	[illegible]
Celebes	—	—
Indo-China	21.8	[illegible]
China	18.9	[illegible]
Japan	792.2	1 [illegible]
Philippine Islands	63.0	[illegible]
Turkestan	—	—
Asia Minor, Palestine	70.9	[illegible]
ASIA	5 823.9	5 [illegible]
Marocco	—	—
Algeria	1 289.8	1 [illegible]
Tunis	40.5	[illegible]
Egypt	84.8	[illegible]
Carried forward	1 415.1	1 [illegible]

(1) Figures supplied by the German Potash Syndicate.

VI. — WORLD'S CONSUMPTION OF POTASSIC FERTILIZERS FOR AGRICULTURAL PURPOSES (*continued*).

Country	Potassic manures as K_2O in metric tons	
	1912	1913
Brought forward	1 415.1	1 570.3
of South Africa	456.9	1 018.1
n Colonies in Africa	230.1	285.8
	1.3	0.2
i Congo	...	...
n Congo	10.8	...
	...	...
r Islands	688.6	1 109.3
	6.9	12.4
'a	67.9	118.5
ius and Reunion	185.8	126.1
lles	...	...
ido Po	...	...
mé and Principe Is.	77.6	129.4
AFRICA	3 141.0	4 370.1
l States	215 965.7	231 689.6
a	279.2	1 375.3
)	108.7	91.3
l America	243.4	278.5
Indies	1 840.4	2 481.2
	2 952.3	3 818.8
	1 104.5	1 270.9
nay	...	...
ay	13.2	20.1
ine Republic	21.1	33.3
	210.5	202.7
a	...	...
	...	...
or	1 315.8	1 004.3
bia	...	0.1
ada	17.5	4.3
) Guiana	0.1	...
Guiana	3.2	12.8
	...	0.1
AMERICA	224 075.6	242 283.3
AUSTRALIA	2 621.1	2 490.4
POLYNESIA	35.0	56.5
TOTAL	903 759.0	1 003 913.2

VII. — World's Consumption of Nitrate of Soda. (1).

Country	1912	1913
	metric tons	metric tons
England	101 080.6	94 360.8
Scotland	36 333.9	34 200.5
Germany	911 962.2	833 112.5
France	354 517.4	327 191.6
Belgium	309 817.0	318 314.8
Netherlands	180 924.2	164 501.9
Italy	44 545.1	51 639.-
Austria-Hungary	7 113.5	7 444.9
Denmark	4 825.2	10 748.0
Switzerland	5 198.0	--
Spain	13 554.0	13 150.-
Egypt	23 981.0	25 637.-
	1 993 852.1	1 880 533.-
United States	441 047.0	589 156.-
Other countries	93 376.9	84 020.-
Chile	2 368.5	3 212.3
Total	2 530 644.5	2 556 971.0

VIII. — Consumption of Nitrogen for Agricultural Purposes Various Countries, 1913 (2).

Country	Nitrate of soda		Sulphate of ammonia	
	Amount consumed	Nitrogen in amount consumed	Amount consumed	Nitrogen in amount consumed
	metric tons	metric tons	metric tons	metric tons
Germany	497 860	74 679	460 000	94 300
United Kingdom	133 000	19 950	97 000	19 885
France	355 000	53 250	90 000	18 450
Spain	15 800	2 070	57 000	11 685
Italy	44 600	6 690	29 500	6 047
Austria-Hungary	7 150	1 072.5	16 000	3 280
Belgium	308 200	46 230	42 000	8 610
Netherlands	183 000	27 450	8 000	1 640
Sweden	5 220	783	1 350	277
Denmark	4 900	735	700	144
Egypt	23 800	3 570	2 000	410
United States	485 000	72 750	235 000	48 175
Japan	21 700	3 255	115 000	23 575
Dutch Indies (Java)	15 000	2 250	57 000	11 685

(1) Figures supplied by the Chilean Nitrate Propaganda.

(2) Figures supplied by the Deutsche Ammoniak-Vereinigung.

Country of destination	1913						1st half-year 1914					
	Crude		Refined		Sublimated	Total	Crude		Refined		Sublimated	Total
	in loaves	ground	in loaves	ground			in loaves	ground	in loaves	ground		
	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons	m. tons
Italy	24 502	1 346	22 507	32 524	595	81 474	17 007	2 255	14 648	33 094	339	67 343
Austria	19 571	128	11 554	4 722	360	36 335	11 701	44	4 377	6 268	61	22 451
Belgium	9 047	65	3 170	990	48	13 320	3 195	.....	291	617	.....	4 103
Denmark	.....	.....	14	201	90	305	.....	.....	3	63	20	86
France	75 062	.....	111	13	.....	75 186	52 114	1	9	214	38	52 376
Germany	9 565	35	10 779	11 217	372	31 968	6 896	.....	4 140	4 247	28	15 311
Greece	.....	705	42	13 350	518	14 615	.....	890	114	14 682	.....	15 686
United Kingdom	7 637	77	2 543	5 558	221	16 036	1 959	.....	1 168	4 096	10	7 233
Norway	1 425	.....	5 637	1 200	.....	8 262	.....	.....	1 623	395	.....	2 018
Netherlands	1 195	10	1 002	6 702	66	8 975	42	.....	1 732	5 580	107	7 461
Portugal	3 003	.....	53	11 423	278	14 757	1 402	507	2	6 504	11	8 426
Russia	22 173	26	1 565	1 910	218	25 892	14 676	5	564	1 699	129	17 073
Rumania	2 700	.....	771	239	.....	3 710	1 495	.....	167	413	.....	2 075
Spain	1 350	601	1 040	3 257	436	6 684	903	376	742	6 804	42	8 867
Sweden	19 378	.....	54	110	.....	19 542	785	.....	83	25	.....	893
Turkey in Europe	.....	3	299	1 597	12	1 911	.....	.....	114	1 057	4	1 175
Canada	.....	.....	.....	.....	.....	.....	.....	.....	.....	388	.....	388
United States	15	.....	134	862	17	1 028	.....	.....	165	554	.....	719
Argentine Republic	2 062	202	722	583	410	3 979	.....	.....	60	13	.....	73
Brazil	951	.....	893	527	54	2 425	20	.....	44	148	.....	212
Chile	.....	.....	.....	520	192	712	.....	.....	.....	96	.....	96
Colombia	.....	.....	.....	.....	51	51	.....	.....	.....	.....	.....	.....
Mexico	.....	.....	38	87	.....	125	.....	.....	20	.....	.....	20
Peru	.....	.....	28	20	.....	48	.....	.....	4	.....	.....	4
Venezuela	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egypt	.....	.....	31	584	.....	615	.....	.....	28	316	.....	344
Algeria	2 370	.....	.....	.....	.....	2 370	525	.....	1	.....	.....	526
Tunis	345	65	13	68	382	872	190	8	17	303	314	832
Union of South africa	12 600	.....	67	1 030	44	13 741	2 060	.....	101	193	.....	2 354
Turkey in Asia	.....	3	42	3 501	50	3 596	.....	2	45	3 492	293	3 832
British India	980	92	1 446	3 151	67	5 736	780	.....	722	835	.....	2 337
Australia	12 549	.....	341	551	.....	14 441	1 591	.....	3	.....	.....	1 594
Other countries	50	.....	2 157	4 137	305	6 649	1 582	.....	2 167	1 152	6	4 907
Total	228 530	3 357	63 053	110 634	4 787	415 378	118 923	4 088	33 154	93 248	1 402	250 815
Mean value	£4 18s 4d	£4 10s 7d	£4 6s 11d	£4 17s 0d	£5 11s 6d	£4 5s 4d	£4 18s 10d	£4 10s 7d	£4 6s 11d	£4 17s 0d	£4 5s 10d	£4 5s 10d

(1) Figures supplied by the « Consorzio solferino siciliano ».

PRICES OF PHOSPHATES, POTASH SALTS AND NITROGENOUS FERTILIZERS DURING THE FIRST HALF-YEAR, 1914.

Phosphates.

N. B. — *European prices are quoted per unit of 22.4 lbs.*
American prices are quoted per long ton.

I. — Tunisian Phosphate, 58-63 per cent. (nominal quotations).

Markets	Mediterranean	United Kingdom	North Sea	Baltic
	d	*d*	*d*	*d*
End of January 1914.....	5	5	$5\frac{1}{8}$	$5\frac{1}{8}$
» February 1914.....	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$
» March 1914.....	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$
» April 1914.....	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$
» May 1914.....	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$
» June 1914.....	$4\frac{3}{4}$	$4\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{1}{8}$

II. — Algerian Phosphate 63-70 per cent (nominal quotations).

Markets	Mediterranean	United Kingdom	North Sea	Baltic
	d	*d*	*d*	*d*
End of January 1914.....	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{1}{8}$
» February 1914.....	5	5	$5\frac{1}{8}$	$5\frac{1}{8}$
» March 1914.....	5	5	$5\frac{1}{8}$	$5\frac{1}{8}$
» April 1914.....	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{3}{8}$	$5\frac{1}{8}$
» May 1914.....	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{3}{8}$	$5\frac{1}{8}$
» June 1914.....	$5\frac{1}{4}$	$5\frac{3}{8}$	$5\frac{3}{8}$	$5\frac{1}{8}$

— ALGERIAN PHOSPHATE, 58-63 PER CENT (nominal quotations).

Markets	Mediterranean	United Kingdom	North Sea	Baltic
	d	d	d	d
January 1914.....	5	5	5 1/8	5 3/4
February »	4 3/4	4 3/4	4 7/8	5 1/8
March »	4 3/4	4 3/4	4 7/8	5 1/8
April »	4 3/4	4 3/4	4 7/8	5 1/8
May »	4 3/4	4 3/4	4 7/8	5 1/8
June »	4 3/4	4 3/4	4 7/8	5 1/8

— FLORIDA HARD ROCK, 77-80 PER CENT (European quotations nominal, American quotations f. o. b. Florida).

Markets	New York	Mediterranean	United Kingdom	North Sea	Baltic
	$	d	d	d	d
January 1914	5.75–6.25	7 1/4	6 3/4	6 3/4	7
February »	5.75–6.25	7	6 1/2	6 1/2	6 3/4
March »	5.75–6.25	7	6 1/2	6 1/2	6 3/4
April »	5.75–6.25	6 3/4	6 3/8	6 1/2	6 3/4
May »	5.75–6.25	6 3/4	6 1/4	6 3/8	6 3/4
June »	5.75–6.25	6 3/4	6 1/4	6 3/8	6 3/4

V. — FLORIDA LAND PEBBLE, 68-73 PER CENT.

ean quotations nominal, American quotations f. o. b. Florida).

Markets	New York	Mediterranean	United Kingdom	North Sea	Baltic
	$	d	d	d	d
January 1914	3.00–3.25	5 5/8	5 1/8	5 1/8	5 3/8
February »	3.00–3.25	5 1/2	5	5	5 1/4
March »	3.00–3.25	5 1/2	5	5	5 1/4
April »	3.00–3.25	5 1/2	5	5	5 1/4
May »	3.00–3.25	5 1/2	5	5	5 1/4
June »	3.00–3.25	5 1/2	5	5	5 1/4

VI. — SOUTH CAROLINA PHOSPHATE, 55-60 PER CENT.
(European quotations nominal, American quotations f. o. b. Mt. Pleas

Markets	New York	Mediterranean	United Kingdom	North Sea	Balt
	$	d	d	d	
End of January 1914	3.50–3.75	5	4 3/4	4 3/4	4
» February »	3.50–3.75	5	4 3/4	4 3/4	4
» March »	3.50–3.75	5	4 3/4	4 3/4	4
» April »	3.50–3.75	5	4 3/4	4 3/4	4
» May »	3.50–.375	5	4 3/4	4 3/4	4
» June »	3.50–3.75	5	4 3/4	4 3/4	4

VII. — TENNESSEE PHOSPHATE, 78-80 PER CENT.
(European quotations nominal, American quotations f. o. b. Mt. Pleas

Market	New York	Mediterranean	United Kingdom	North Sea	Balt
	$	d	d	d	
End of January 1914	5.00–5.50	7	6 1/2	6 1/2	
» February »	5.00–5.50	6 3/4	6 1/4	6 1/4	
» March »	5.00–5.50	6 3/4	6 1/4	6 1/4	
» April »	5.00–5.50	6 3/4	6 1/4	6 1/4	
» May »	5.00–5.50	6 3/4	6 1/4	6 1/4	
» June »	5.00–5.50	6 3/4	6 1/4	6 1/4	

VIII. — CHRISTMAS ISLAND PHOSPHATE (nominal quotatio

Market	Mediterranean	United Kingdom	North Sea
	d	d	d
End of January 1914	8 1/2	8	8 1/4
» February »	8	7 3/4	8
» March »	8	7 3/4	8
» April »	8 1/4	8	8
» May »	8 1/4	8	8
» June »	8 1/4	8	8

IX. — Ocean Island Phosphate (nominal quotations).

Markets	Mediterranean	United Kingdom	North Sea	Baltic
	d	*d*	*d*	*d*
d of January 1914	8 1/4	8	8 1/4	8 1/4
» February »	8	7 3/4	8	8
» March »	8	7 3/4	8	8
» April »	8 1/4	8	8	8
» May »	8 1/4	8	8	8
» June »	8 1/4	8	8	8

Potash Salts.

X. — Maximum Prices for Potash Salts fixed by German Law.

	Potash content	Per unit of 22.4 lbs
	per cent.	*s* *d*
rnallite	9–12 (ground)	10 1/4
ıle salts (kainite, hartsalz, sylvinite)	12–15 (ground)	1 0
tash manure salts	20–22	1 4 2/4
» » »	30–32	1 5 1/2
» » »	40–42	1 6 1/2
loride of potash	50–60	2 8 1/4
» » »	above 60	2 10 5/8
alphate » »	above 42	3 5 7/8
» » magnesia		3 1

XI. — CURRENT PRICE OF POTASH SALTS IN GERMANY, CALCULATED FROM TABLE X.

Nature of salts	Potash content	Price per ton		
	per cent.	£	s	d
Carnallite	9		7	7
»	10		8	6
»	11		9	4
Kainite (hartsalz or sylvinite)	12		12	0
» » » »	13		13	0
» » » »	14		14	0
» » » »	15		15	0
Potash manure salts	20	1	8	0
» » »	21	1	9	6
» » »	22	1	10	10
» » »	30	2	3	3
» » »	31	2	4	8
» » »	32	2	6	2
» » »	40	3	1	8
» » »	41	3	3	2
» » »	42	3	5	0
Kainite, ground fine, special type for the destruction of weeds			5	0 (extra)

The above prices (Tables X and XI) refer to fertilizers consumed Germany. For other countries the prices are fixed each year at the b ginning of the season and are reckoned as at Stassfurt, always at high prices than the same fertilizers intended for home use.

XII. — PRICES OF POTASH SALTS AT NEW YORK, JANUARY-JUNE, 19

Nature of salts	Potash content	Price per long ton		
	per cent.	$	£	s
Kainite	12.4	8.36	1	14
Hartsalz	16	10.87	2	4
Potash manure salts	20	13.58	2	15
Double » »	48–53	25.04	5	2
Sulphate of potash	90–95	47.57	9	15
Cloride » »	80–85	41.65	8	11
» » »	95	40.75	8	7
» » »	98	39.07	8	0

The New York market prices are used by the experiment stations value commercial fertilizers in the States in which the fertilizer trade controlled.

Nitrogenous Fertilizers.

XIII. — PRICES OF NITRATE OF SODA PER LONG TON ON THE SPOT.

Markets *	Antwerp			Dunkirk			Genoa			Hamburg			Liverpool			New York			Rotterdam		
	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d
y 1914.....	9	18	7	9	19	5	10	11	6	9	19	5	10	8	6	10	4	10	10	1	11
ry "	10	6	3	10	9	6	10	11	6	10	9	5	10	10	0	10	4	10	10	10	10
"	10	0	3	10	2	3	10	11	6	10	4	11	10	11	10	10	4	19	10	5	11
.....	9	8	6	9	10	2	10	4	5	9	9	0	10	6	3	10	4	10	9	12	0
.....	9	11	4	9	12	7	10	2	2	9	14	0	9	18	6	10	4	4	9	13	0
.....	9	13	4	9	18	7	10	2	2	9	10	0	9	17	6	9	17	11	9	15	0

ll quotations are for the end of the month except in the case of Liverpool which, gives aveices for the month.

V. — PRICES OF SULPHATE OF AMMONIA PER LONG TON ON THE SPOT.

Markets	Antwerp *Comptoir* end of the month			Genoa (end of the month)						Hull (middle of the month)			New York (end of the month)			Paris (end of the month)		
	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d	£	s	d
ry 1914 ...	12	19	10	13	7	11	–13	10	0	12	7	6	13	2	4	12	17	10
ry " ...	13	1	10	13	5	11	–13	7	12	12	9	8	13	2	4	12	13	9
...	13	1	10	13	3	10	–13	7	11	12	7	6	13	2	4	12	13	9
...	11	17	8	12	17	10	–13	1	10	12	4	2	13	2	4	12	5	9
...	10	17	6	12	9	9	–12	11	10	11	6	0	12	8	7	11	13	8
...	11	1	7	12	7	9	–12	9	9	10	9	4	11	7	10	11	11	8

— WHOLESALE PRICE OF NITROGEN PER UNIT OF 22.4 LBS AT ANTWERP.

Nitrogen contained in :	Nitrate of soda		Sulphate of ammonia		Calcium cyanamide		Nitrate of lime	
	s	d	s	d	s	d	s	d
January 1914.....	12	10	12	10	12	2	14	8
February "	13	3	13	0	12	2	14	8
March "	13	0	13	0	12	2	.....	
April "	12	1	11	9	12	2	.....	
May "	12	4	10	9	.....		.....	
June "	12	5	10	11	.....		.....	

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FIRST PART.

ORIGINAL ARTICLES

Agricultural Education in Hungary

by

JÁNOS NYÁRÁDY.

gricultural instruction in Hungary is given in the following special ional establishments :

yal Veterinary College at Budapest.
yal Agricultural College.
ricultural Training Colleges for primary school teachers.
ools of Practical Agriculture.
yal Dairy School.
hool for Dairymen.
her schools for special branches.

There are further 28 lecturers from the Training Colleges acting as t organisers and advisors.

Royal Veterinary College at Budapest. — This institute : *a*) provides rse of instruction and training in veterinary science ; *b*) grants es to veterinary surgeons ; *c*) furthers the interests of veterinary e by observations and experiments ; *d*) provides expert opinion for ions of veterinary science and hygiene ; and *e*) obtains information overnment purposes or for the Law Courts on veterinary questions. course lasts four years (eight terms) and students to be admitted re- to have taken the school leaving examination of the middle schools ; s kept in a foreign veterinary school of similar standard are recognised the course leads to graduation with a doctor's degree. The staff ists of a director, twenty lecturers and 25 assistants and clerks. Dur- he session 1912-1913, 190 students were in attendance.

Royal Agricultural Colleges. — Students having been through the lle schools and requiring a higher agricultural education, both prac- l and theoretical, go to one of the five Royal Colleges at Debreczen, sa, Keszthely, Koloszvár and Magyaróvár respectively. These institu-

tions take both full-time students and those who only wish to follow certain lectures. The course lasts three years (6 terms) and during the first year the instruction chiefly takes the form of practical work. The following subjects are taught at the Colleges: natural history, physics, plant production, rural economics, social economics, and practical agriculture including special branches.

Each College has a farm of 640 to 1100 acres attached to it for instruction in the actual practical work. Besides teaching, the staff carry on a certain amount of experimental work and advises on agricultural questions, for which purpose an agricultural consulting committee has been organised in each institution. During the session 1912-1913, 452 full-time and 9 part-time students were in attendance. The capital involved in these institutions amounts to £267 808, while the returns from the farms in 1913 were £3 144 (1).

Training Colleges for Elementary School Teachers. — Two training colleges have been established, one at Kecskemét for men and the other at Komárom for women (2) in connection with the Schools of Practical Agriculture in those places. Students who have taken the college diploma may become teachers in the rural complementary schools and some of the women students take up posts in the schools of domestic economy. The course lasts two years and only those candidates are admitted who already hold their teacher's certificate and are under certain age limits, *viz.* twenty-two and twenty-four years old for men and women respectively. Forty students can be taken at Kecskemét and thirty at Komárom; the teaching staff amounts to seven and five lecturers respectively. Instruction is both practical and theoretical, the performance of a certain amount of practical work being compulsory. Women students are given general instruction in domestic economy as well as in agricultural subjects. Excursions are arranged to visit model farms in districts where poultry farming and market gardening are important industries, in order to provide the students with good object lessons in those branches. The students are further called upon to give popular lectures and demonstrations as part of their training.

Schools of Practical Agriculture. — These are the most elementary agricultural schools in Hungary and provide technical instruction to the sons of small farmers and under-managers on large estates. They are under Government administration and their organisation varies with the requirements of the district in which they are situated: for instance those at Ada, Békéscsaba, Hodmezövásárhely, Jászberény, Karczag, Kecskemét and Nagykálló have a six-months course for farmers and small landowners in the general management of holdings, while the schools at Kisszeben, Lugos, Pápa, Rimaszombat, Somogyszentimre, Algyógy, Breznóbánya, Csák, Csikszereda, Komárom, Nagyszentmiklós and Szilágysomlyó have

(1) See also No. 453, B. May 1913.

(2) See No. 402, B. May 1914.

wo-year course and give more advanced instruction adapted to the ning of farmers, under-managers and inspectors.

In all these schools the instruction is chiefly of a practical nature and h stress is laid on the satisfactory performance of the various kinds of ual work; on the theoretical side, only the most fundamental and in- ensable facts are treated, the object being to keep the whole scheme of ation at a popular level. Schools which are destined solely for the ning of under-managers take pupils of twenty-two years of age, pre- ly after they have finished their military training; other schools it pupils of seventeen years old and upwards. At Algyógy there is mmodation for sixty internal students, who do all the practical work oth the fields and the garden.

Short elementary courses, lasting two months, are organised at these ols during the winter for adults who cannot leave their farms for a er period of time. Besides these, short summer courses lasting four ks are held for elementary school teachers who wish to qualify as comple- tary school teachers, and popular lectures are given to the farmers of the rict on the use of farm implements and the cultivation of special crops. ing the winter the regular students receive instruction in the domestic ustries. All teaching is done in the simplest language and illustrated h practical experiment and demonstration; for this reason, special ortance is laid on the organisation and equipment of the model farms, ch cover altogether an area of 11 700 acres, part of which is State ed while the rest is either let or given rent-free by landowners. The rns on these farms for 1913 amounted to £4873.

The staff of each school consists of a director, an agricultural demon- tor, a gardener and a practical assistant

Besides these State schools there is an Agricultural School belonging he town of Szabadka staffed by Government teachers. Private Agri- ural Schools receiving State grants are also to be found at Csákvár, tercze, Földvár and Medgyes; they are organised on similar lines to State schools.

Royal Dairy School at Sárvár. — This institution provides suitable ning for managers or skilled workmen of milk and cheese factories. Though tudents receive both practical and theoretical instruction they are ded into two classes according as they are preparing to become managers illed workmen. The former class have to be over twenty years of age to have already been through a course at a school of practical agri- re; the latter class are admitted at seventeen and only require to be to read and write; during the session 1912-1913 attendances num- d 4 students of the former class and 17 of the latter. The course lasts year.

Schools for Dairymen. — There are two of these, at Kisbér and Csák. ourse is essentially practical and lasts one year.

The State Lecturers who teach agriculture in the agricultural es also act as advisors and organisers in the various districts, agricultural articles for the local papers, give lectures and

supervise model farms. Besides these twenty-eight lecturers there two lecturers in secondary boys' schools to help with the general organi and advisory work and four specialists to advise more particularly on cultivation of potatoes, hops, hemp and flax, and on the improvem of pastures.

A School of Domestic Economy has been created at Putnok for daughters of farmers, while seven travelling schools each under the cont of two teachers give courses lasting six weeks in other parts of the coun They receive State grants amounting to £1666 annually.

During the winter popular agricultural lectures are given, towa which the State makes an annual grant of £4170.

Special schools also exist for the various branches of agricult such as poultry keeping, bee keeping, viticulture, horticulture, forestry, e

In conclusion the following figures summarise the annual expendit by the Hungarian Government on agricultural education, which is also entirely directly dependent on the State.

	Ordinary expenditure	Extraordinary expenditure
	£	£
Royal Veterinary College	21 846	4 417
Agricultural Colleges.	48 929	9 793
Lower agricultural education, including advisory and organising work	84 047	22 000
Totals . . .	154 822	36 209

Reclamation in the Province of Ferrara

by

Prof. VITTORIO PEGLION,

Formerly Director of the Travelling Lectureship in Agriculture at Ferrara, Professor of Agriculture in the University of Bologna.

The agricultural awakening of the Province of Ferrara has closely connected with the carrying out of the projects of reclamation work was begun under the rule of the Este family, but reached its gr development in the second half of last century, when, with the h modern engineering methods, human activity was able to attack conquer the problems entailed in the definite and permanent reclam of the marshes and lagoons.

The traces of the work carried out by the organizations form deal with these problems as far as the then existing means would will never be effaced ; the division of the Ferrara territory into four dra districts still exists, and it may truly be said that the colossal work of m nical drainage performed on the second and third of these forms o the most imposing monuments to the civilization of the third Italy.

Out of the 655 000 acres forming the territory of the Province, one
v reckon 155 000 as still occupied by bracks used for fishing (115 000
:) or by rivers, canals, buildings, etc.; the remaining half a million acres
esent the raw material of agricultural and forest production. The
named may be left out of consideration, as the woods occupy hardly
uch as 6 500 acres, mostly in the territory of Mesola, — a poor remnant,
h, with the classical pinetum of Ravenna, serves to recall the vast
:ts of holm-oak and pine which in ancient times clothed the further
gins of the lagoons of Venice and the Romagna.

The survey of 1835 divided this area of 500 000 acres into 204 020
s of field crops, 172 080 acres of natural meadows and pastures, and
953 acres of reed-beds; the data for the agricultural survey of 1906
v 399 608 acres of crops and 80 015 acres of meadow, leaving some
00 acres for woods and vineyards.

These figures give a clear idea of the scope of the reclamation work:
arable area has been *doubled* as a result of draining the marshes and the
eadows and pastures" — a euphemistic way of referring to swamps,
:ly or quite unproductive; these have been turned into highly fertile
ns on which wheat, hemp, beets and leys extend yearly and give such
:mous crops that this land must be considered as among the most pro-
tive in the whole of Italy.

At the present time the agricultural land of Ferrara consists of a com-
: patchwork of newly-reclaimed plots with the ancient holdings and
d lands" under cultivation for centuries. Although the contemporary
od of this story contains many unfortunate episodes, so that with the
es of the successful men must be mentioned others who have spent
ir labour and means in vain, yet the impetus to further conquests shows
diminution. There are already 215 000 acres from which the drainage-
er is drawn off by 18 pumping-stations, and projects are on foot for
further areas, each of some 20 000 acres: one belonging to the northern
ls ("valli") of Comacchio, and the other in the salt levels of Argenta
Porto Maggiore, which will form the so-called Mantello innings ("boni-
del Mantello").

In contrast with this land drained mechanically by pumps — that
e typical Ferrarese type of undertaking — should be considered the
in the commune of Bondeno which has a natural outlet, the water
ing off by means of the great canal of Burana or Volano, which passes
r the river Panaro by means of the famous "Botte Napoleonica".
i vast zone of reclaimed land consists of 26 690 acres in the Province
'errara, 54 750 acres in the Province of Modena and 47 060 acres in
Province of Mantua. With the drainage water from this great basin and
possibility of receiving water from the main stream of the Po through
Pilastresi sluices, the old Volano course of the Po has again become
ver rather than a canal, and indeed for a considerable distance has
tural fall; it has also become the principal waterway of the Ferrara
ict, as well as a source of water for agricultural purposes.

The particulars of these reclaimed lands have been given in detail various publications, to which we would refer readers who wish to stu the question more in detail. In this short account it seems best to conf our attention to certain features of a general character.

From the purely technical point of view reference should first be ma to the great difference in the problems presented according as the la has been reclaimed from freshwater or from saline marshes (" valli dole or " valli salse ").

The low-lying parts of the *freshwater marshes*, prior to drainage, we occupied by a more or less vigorous growth of reeds or other marsh plan The succession of generations of such rhizomatous plants for centur has given rise to strata of peat (" cuora "), in some places reaching a suf cient depth to allow of utilization for burning or as raw material for ce tain industries. But even these marshes rest on a distinctly saline subso as can be seen at once from the nature of the water at some depth. Exce for the markedly peaty areas, which require quite special treatment, w may say that these soils present no special obstacles to opening for cultivation. With systematic treatment they may in a short time put under highly paying crops. The fact that sufficient care has not alwa been taken in dividing up these lands is due to difficulties of a differe character (to which we shall refer shortly) and not to the physical characte of the soil.

The behaviour of the land obtained by reclaiming *salt areas*, or *brac* is totally different, and as the new schemes refer to the inning of la covered by salt water it seems advisable to go more into detail this point. Anyone familiar with the " Gallare " — typical of innir of this kind — or similar farms, such as what was once the Tass brack (reclaimed by Cav. M. Marini), knows that considerable ar may remain refractory to the usual methods of cultivation for seve decades after the completion of the engineering works freeing them fr water. Soils impregnated with saline matter, such as those inned from t lagoon, require special treatment to deal with the sterility resulting fr the accumulation and continual change of level of these salts in the ara layer. We may here mention one or two fundamental points of such tre ment not always remembered by the promoters of the reclamation of bracks: owing to the position of these soils, their physical and chemi composition and their structure, and owing to the enormous quantity salt contained in the mass, the possibility of profitable cultivation — wh the engineering work is finished — is not only dependent on a perio absolute unproductivity, much longer than is generally admitted, even later is subject to variations which cannot be foreseen and which due to the special behaviour of the saline matter.

We have already given prominence to these considerations, thou fully aware that they cannot outbalance the reasons of a social nat and especially of convenience which have created an opinion decide favourable to the carrying out of the reclamation of the stretches of lag in question. It would be well that the example of the practical res

ished by the reclamations already accomplished should not be taken
e only criterion for the opening up and improvement of the neighbour-
land, which is not always in a suitable condition for reclamation with
w to agricultural use. The planning, the execution and the completion
e past, present and future reclamations should not be effected entirely
e detriment of the " water farming " (vallicoltura) ; an investigation
ld be undertaken with a view to establishing once for all the productive
city of this land under water and the best means of encouraging a
nable and intensive " farming " of it ; such " farming " requires far
sinking of capital and at the same time lends itself to the natural ten-
ies of the local inhabitants concerned, so that it might well hold its
in comparison with the arable land to be inned from these inlets of
lagoon.

The fundamental work of reclamation for both freshwater and salt
s consists in drying, that is in the mechanical drawing-off of the ground
r. There is not the slightest doubt as to the perfection with which
is now carried out by the engineers, who are thoroughly versed in the
ng up of the necessary plant and in the maintenance of the scheme of
nage ; in all the operations so far carried out the removal of the water
btained in the most perfect and simple manner possible ; though the
odical evacuation of the water is the primary necessity for these tracts
at such a very low level, it is only one side of the complex problem
led in opening them up for agricultural use.

This drying is naturally only relative, allowing a certain depth of free
bove the water-table. For this reason the individual characteristics
e different soils, especially as regards water-holding capacity, should
ken into account ; evidently sandy and clay lands cannot have the
treatment. The possibility of cultivating these reclaimed lands
rly depends in particular on the reserves of water which the crops
at their disposal, and obviously an excessive drying may be as inju-
as a condition of stagnation leading to swamp formation.

The working of the pumping engines is so regulated as to avoid any
r in this direction. In some of the very large sections covering
thing like 100 000 acres there are considerable differences in level ;
ch cases it is now the rule to keep the so-called high-level water
ate from the low-level water, the two being dealt with by different
ping stations. As an example of this may be mentioned the system
ted by the Association for the " Grande Bonifica " ; for the completion
is area, carried out between 1905 and 1910, they rearranged the old
n at Codigoro to dispose of the high-level water (from an area of 39 929
), while the low-level water (from 89 875 acres) runs off by means of
station put up close to the old one.

Although the drying is carried out in accordance with the needs of
ops, these are subject to the same risks as those on the neighbour-
d lands as regards water supply. Indeed seasons in which the yield
se artificially dried soils is seriously reduced by drought are by no
s rare.

In fact drought makes itself felt more severely on these soils, as t water is liable to take up mineral matter from the subsoil, constantly impre nated with salt, and may thus become too saline for the ordinary cro We have elsewhere had occasion to refer to the difficulties attendant up the excess of saline matter in the water taken up by the arable layer, wh may provoke a special condition of " physiological drought "; the sam point has been referred to by Tacke in his masterly advice on the wa economy of moor and fen soils: " The drawing-off of the water must done with great care, as organic soils retain large quantities of water wi such tenacity that the roots of the plants growing in them cannot make u of it; in such soils plants may suffer from lack of water in presence considerable quantities of it....; once the stagnant water has been dr with and the land brought under cultivation, only small amounts water should be drained off".

Pure sandy soils require similar treatment, as their productiv depends entirely on the presence of the water-table near enough to t surface to be within reach of the roots. The vineyards of Comacchio a parts of the cultivated land of the Mesola are in a flourishing condition sol because the water conditions have not been disturbed; they form a mark contrast to certain old sandhills wedged in between low-lying reclaim zones and consequently subject to excessive drainage: the careful runni off of the rainwater and the lowering of the water-level in the soil h led inevitably to absolute sterility in the higher sandhill tracts. In modern work of completion of the Grande Bonifica it was recognized t this area would have to be isolated from the remainder and submitted special treatment suitable for sandy land.

So far no plans have been made for correcting any possible defic cies in the drainage schemes by means of irrigation. It is certainly exasperating in some years to have to watch the crops daily drying owing to continued drought, while up above the Grande Bonifica rises great bank holding in the water of the Po on its way to the sea; the water is, however, coming to be used for hygienic and agricultural purp as the need has become more acute with the yearly increase of the per nent population of the reclaimed lands.

It should be recognized that while the removal of the water – main scope of the *engineering reclamation* — presents great difficu the difficulties encountered in the *agricultural reclamation* — that is o ing up the land for cultivation and colonization — are equally serious not more so. The water from the ditches and main drains, as well as ordinary well water, is absolutely unfit for watering cattle or for house and agricultural purposes; it is charged with saline and organic m and becomes putrid in summer. Petitions for a supply of drinking w used frequently to be made by the people of the reclaimed areas it was owing to the initiative of the Commune of Iolanda di Savoia tha legislation in vigour was altered, so that by the law of June 25 and 13, 1911, communes in reclamation areas were added to the list of allowed special facilities for the provision of drinking water. " If

mune, planned and founded contemporaneously with the carrying of the reclamation scheme, cannot boast a past, it may well be proud s present work": so said Comm. A. Marangoni, who has been intimately nected with the Grande Bonifica of Ferrara, on the 15th of June, 1913, pening the communal aqueduct, by means of which Iolanda di Savoia as no longer fetid and stagnant water spreading fever and death, but e and healthy water shooting up to many feet above the ground and ging healthy and vigorous life to these redeemed lands."

In the vast area of the Grande Bonifica (133 000 acres) provision has n made for obtaining water from the Po by means of four syphons, nned and constructed under the direction of Ing. Pasini. All the farms the area feel the benefits of this work in completion of the reclamation, they can provide water for the watering of live stock, for household and for retting hemp. A logical finishing touch would have been the rying out of Ing. O. Balduzzi's scheme for a Po valley aqueduct, to vide drinking water to the 103 200 inhabitants of 11 communes lack- it. As this remained in the condition of a project, the Ferrarese Re- mation Society — whose land makes up the greater part of the Commune Iolanda di Savoia — with its usual enterprise, took up the construction the communal aqueduct under the provisions of the law mentioned; Po water is filtered and purified on the Puech-Chatal system and brought o the area by a steel conduit 18 miles long; finally it is distributed to chief farms and groups of houses in the territory of the commune at rate of 14 000 cu. ft. per day.

The Volano Po, or Burana, which runs from west to east through the vince of Ferrara, has also been laid under contribution for water for icultural purposes. Its value has been increased since the construction the Pilastresi sluices has allowed water from the main Po to be run o it, but unfortunately the Burana is, and will continue to be, chiefly rainage canal into which are run the waters from the 3rd, 4th, and 6th tions of the Burana innings: it also receives the water from the hemp- ting and in particular the refuse water from the sugar factories along course. For these reasons water from it has a very limited use, and one the associations most concerned is now making plans for obtaining water ect from the Po for the needs of its vast territory.

While the provision of water for agricultural purposes in this 3rd inage section is difficult and costly, the provision of drinking water is ually so and sometimes not economically possible: we do not here refer to linary wells, as with rare exceptions the water they give is scanty and bad. far the best results have been obtained by deep tubular wells, of which re are a certain number here and there in the Ferrarese territory. eir depth varies from 80 to 600 ft.; some only lasted for a very short ne, while the use of the water from some others was prohibited for pre- sterous hygienic reasons about the quality. Special mention should made of the well bored at the Bastioni farm on the Val Gallare property; is is nearly 600 ft. deep and for over thirty years has given a constant pply of about 1 ½ gallon per second. Last year this source was covered

in, and after filtration it is now distributed through 12 miles of steel tub ing to 40 fountains at the numerous farms round.

Yet another vital problem of the reclaimed zones remains to be men tioned, namely the question of means of communication: there are still large areas inaccessible for several months in the year owing to lack of roads the laying of good roads to connect the reclaimed lands with the nearest centres requires a great outlay. Happily the most economic means of transport of agriculturial produce, namely by water, can to some extent be substituted for roads, which in these one-time bracks are yet to come. The chief canals have indeed been arranged so as to be navigable, but access to the wharves or landing-stages must be provided and the farms must be joined up one to another and to the nearest centres. There is no need to go deeply into the question, as the above will suffice to call attention to one of the causes which has contributed and still contributes to retard colonization of the reclaimed areas.

These considerations indicate that it would be very instructive to make an investigation into the real cost of reclaimed land, especially so as to be able to make proper comparisons as to the utility of continuing the inning at the expense of the lagoon. There is a fundamental difference between schemes which have in view the reclamation of land at present more or less completely and constantly submerged under salt water, and such schemes as the great Rhine reclamation, now being carried out, in which it is a question of laying out permanent drainage for vast stretches of land whose productive power is paralized by the lack of a proper outlet for their waters. Probably, however, the calculation of the true total cost of such reclamation can never be made: it would show up the perseverance and strong spirit of initiative possessed by the past generation of farmers who selected this extreme corner of the Po Valley for their operations. The names of Count Francesco Aventi, Count Luigi Gulinelli and Ing. Gerolamo Chizzolini — to mention only some of those no longer living — will always be remembered as among the numerous band of pioneers who devoted brains and money to carrying through this reclamation work. It should be repeated here that the fundamental work of engineering re clamation was performed on private initiative and with private capital at a time when the Government seemed almost ignorant of the existence of any such important problems. It was only after the passing of the law of 1882, modified in 1901, that the State took a part in the completion of the work.

It will still be possible to calculate what has been spent by the State and by local bodies in completion of the work, at any rate where such expenditure was undertaken to satisfy collective needs. But the total sum sunk by private persons defies all attempts at estimation, whether it be that expended on the large properties organized on industrial lines or that due to large, medium or small landowners.

Among the large organizations for intensive cultivation or industrialized agriculture, special mention should be made of the Ferrara Land Reclamation Society and its derivatives — the Immobiliare Lodigiana, the Immo

Veneta and the Amministrazione Mazzotti, besides other smaller comprised in the Association for the Grande Bonifica — and of the allare and Valle Volta Societies, comprised in the 2nd section; all have been the subject of numerous publications and serve as object s for all engineers and agriculturists. No less worthy of mention e numerous farms whose present prosperity is the fruit of the labours aith in the agricultural industry of the much abused class of large mall Ferrarese landowners.

he fertility of the redeemed land, after it has been properly laid as often been referred to: yields per acre exceeding 37 bushels for 16 tons of beets and 12 cwt. of hemp lint are by no means excep-

There are still a few pieces of land, which as Prof. Munerati wrote time ago, have not yet been awakened by phosphatic manuring, the ation-stone of scientific agriculture; such lands require an enor- expenditure of capital to bring them under cultivation, and they have bed and continue to absorb a large part of the returns given by the on them.

n the early years of cultivation these lands were robbed by excessive growing: they form another example of the specialized agriculture is started wherever virgin land is suddenly opened up for farming, own by the agricultural history of all countries. But this extensive ation had a short life; these reclaimed lands gradually came to ble the densely populated old lands surrounding them, as regards the ing plan, the arrangement of the farms and the means of production. The tendency is to form farms of about 75 acres — the old-fashioned suro" — which, at any rate in the early stages, are run on the "boa- " (1) contract system. Many private estates have already reached condition, and modern necessities incline to still further reduction e holdings, so as to make them suitable for farming on the métayer m or for letting to colonizing families. On the larger estates such ion exists only in theory, as the complex circumstances already tioned prevent its being carried into practice.

We may finish up with a few statistics, which refer to the whole pro- e of Ferrara and not only to the reclaimed areas. The following table

Crop	Average 1862-1871		Average 1909-1913	
	Per acre	Total	Per acre	Total
. . . . . bushels	16.26	1 875 335	29.13	4 323 935
. . . . . cwt. .	6.3	294 375	9.0	619 900
. . . . . tons . .	—	—	14.9	226 966

(1) The "boaroco" contract is one in which a head ploughman is put in charge of a number of teams of oxen; he is housed and receives part money wages and part in kind. (*Ed.*)

gives the average yields of certain crops for the decade 1862-71 in comparison with the agricultural statistics for the 5-year period 1909-13.

The cattle numbered 70 000 in the 1869 census and 110 320 in the 1 census.

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The Swine Raising Industry in Canada

by

J. B. SPENCER, B. S. A.

Editor and Chief, Publications Branch, Department of Agriculture for Canada.

The swine raising industry in Canada is closely allied with what may termed general agriculture or mixed farming. Even the early settl raised a few hogs to supply themselves with meat and to provide a produ acceptable to the local merchant in exchange for products of commer With the development of urban populations and the growth of the lumb ing industry, there grew up a demand for pork products. In the case of be the butcher very early became a necessary factor, while in the swine dustry, the farm continued to combine the breeding and feeding operati with the slaughtering and curing of meat. Then there arose a more less extensive fresh pork trade, but it was not until the packing hou were established about 1860 that an export trade began.

Of the early years of the industry, Mr. William Davies of Toronto, pioneer pork packer of Canada, writes :

> Fifty years ago or even more, large numbers of dressed hogs were brought by farm to Toronto. Besides the few that were bought by local dealers many were bought by c mission men in the city for local operators in Montreal. These carcases were choppe and packed in barrels with a certain amount of salt, then coopered up tight and fille water and brine. These barrels were then shipped by boat to the consignees in Montrea a few instances they were taken down by local Toronto men. Arrived in Montreal t barrels of pork were taken to a Government Inspection Warehouse. The inspectors sworn Government Officials and they made out a bill for each owner specifying so m barrels of mess pork, so many of prime mess, etc., and armed with this certified bill products could be sold to Montreal merchants, from whom the stuff found its way into pineries to feed the lumbermen. At that day there was positively no export trade.

that a reciprocity treaty with the United States was enacted and as hogs were much plentiful in the United States than in Canada, and mess pork in barrels was put up e United States on a very large scele, it came to Canada duty free and thus there a considerable surplus available for export, especially as the kind of hogs desiderable he lumbermen's use were "mammoths" while the sort desirable for export were ht weights". From that time the export business increased largely.

While the market for Canadian pork products was confined principally , home demand, there was no incentive to change from the customs that become well established, but so soon as there was an appreciable quantity export, the requirements of the importing country had to be reckoned with. It was, as it is today, the business of the farmer to raise the hogs, to find a market depended upon the commercial man, who, in this e, was the pork packer. Fortunately for the industry, which expanded y rapidly, there were in Canada farseeing men engaged in the pack- business, and on these the swine raising industry depended more than n any other agency. They set about developing the right kind of hogs the best trade.

The English market demanded medium weight hams and "Wiltshire es" full of lean meat. Experience taught the packers that the Yorkshire l Tamworth breeds excelled in these particulars. To encourage farmers raise hogs of these breeds, leading packers imported boars and distribu- l them in hog raising sections. This was done in sections of Ontario about 90. The result was very pronounced and in the desired direction, for in ew years Canadian hog meats became very popular on the British rket.

The possibilities of the bacon industry appealed to Provincial and Do- nion Governments perhaps more especially at the beginning. The Ontario partment of Agriculture during several years in the nineties conducted a st effective campaign on behalf of the "bacon" hog. By means of nter Fairs and Farmer's Institute meetings, Ontario farmers were shown nclusively that the "bacon" hog was the most profitable to raise and e most readily sold in the best markets of the world. The correctness the teaching in those days is amply borne out by the report of the Swine mmissioner who visited Denmark and found that the Danish pig, from ich the highest-priced bacon in England is made, corresponds exactly th the pigs advocated for Canadian farmers and at the present time raised l them in every province. The results of this campaign of education re so pronounced that within a few years the railroads leading to the large cking houses were loading hogs at almost every country station once or tener weekly with stock that came well up to the standard for the export ade.

Nor were the other provinces asleep in regard to the swine breeding dustry, as in each one of them excellent progress has been made, more pecially in the matter of quality. In each and every province the "bacon" g is the Standard and the pigs that win the best awards in the Eastern prov- ces are of the same general type, age and weight as those that take the st awards in Ontario and in the Western provinces.

The Federal Department of Agriculture has done much to up the industry, more especially in the provinces outside of Ontario. Throu the Branch of the Live Stock Commissioner the teaching commenced Ontario has been extended to other parts of the Dominion both at Institu meetings and Winter Fairs, while these latter organizations have been duced to frame their prize lists so as to encourage only breeds of the "baco type. The Federal Department of Agriculture, in conjunction with oth agencies, has also distributed by means of section sales and throu Farmer's Clubs breeding swine of superior quality. Then the Experimen Farms have rendered and continue to render a highly valuable service experiments carried on more especially at the Central Farm, where the qu tions of economical feeding and sanitary housing have been very larg solved.

The Export Trade.

From small beginnings in the early nineties, the export bacon trade wi Great Britain grew by rapid strides until in 1905 Canada supplied the Moth Country with about 20 per cent of her imported bacon. For a number years a highly satisfactory export trade was maintained, but since 19 a decline has been in operation until Canadian supplies to the Old Land ha fallen to about one-third what they were when the trade was at its height.

It must be noted that up to about 1884 much of the export pork w made from United States hogs. Soon after that time Canadian hogs we raised in sufficient number to keep the packing houses supplied.

The following table shows the exports of bacon, hams and po from 1868 to the fall of 1913.

Exports of Bacon from Canada.

Fiscal Year	Bacon	Hams	Pork	Total
	lbs.	lbs.	lbs.	lbs.
1868	—	10 580 528	3 506 048	14 086
1870	—	19 627 216	6 544 384	26 171
1880	8 616 739	955 603	1 281 391	10 853
1885	7 189 260	962 827	555 436	8 707
1890	7 235 336	256 746	233 899	7 725
1895	37 526 058	2 607 963	519 736	40 653
1900	132 175 688	2 856 186	1 109 550	136 141
1905	116 835 050	2 806 263	2 235 936	121 937
1908	92 001 910	3 173 950	769 932	95 945
1909	70 564 927	3 271 312	335 343	74 171
1910	45 576 883	3 242 806	599 081	49 418
1911	56 068 607	3 805 918	417 577	60 921
1912	59 979 963	3 124 595	434 480	63 539
1913	36 212 190	2 470 654	521 533	39 210
1913*	15 522 804	1 144 707	370 993	17 038

* April-October.

The falling off in exports does not indicate a serious decline in the g of hogs. According to the Census of 1891 there were that year on ian farms 1 733 850 hogs, which number had increased ten years to 2 353 828, and in 1911 to 3 610 428.

Federal meat inspection in Canada, which is confined to establishments an export or inter-provincial trade, was inaugurated in September, The following table shows the number of hogs slaughtered in inspected olishments in Canada year by year since that time :

Swine Slaughtered in Canada at Inspected Establishments (1).

	Number
8 months ending March 31, 1908	861 989
Year ending March 31, 1909	1 532 796
» » » » 1910	1 261 496
» » » » 1911	1 452 237
» » » » 1912	1 852 997
» » » » 1913	1 607 741
10 Months ending January 31 1914	1 456 615

The decline in exports must, in large measure, be attributed to increas- onsumption in Canada. During the years of heavy export the supplies ed out were produced almost entirely in the Province of Ontario. The rn provinces, while filling with people, were slow to produce hogs until ast two or three years, when a great increase in production has taken . Up to 1913 packing houses in Ontario and Quebec had a large et west of the great lakes, but the tide has turned. Prairie province ers, owing to continued high prices for pork, have turned their attention and more to the feeding of hogs on their low grade and damaged , and since the fall of 1913 have been shipping hogs east in large numbers. ng 1913 the slaughtering of hogs in Canada showed a very slight in- e over that for 1912. The killings in eastern houses showed a decrease h was slightly more than met by an increase in the west. This is borne by statistics supplied by the Meat Inspection Division of the Department griculture in the following table.

Hogs Slaughtered in Inspected Houses.

	1913	1912	Increase or Decrease
Eastern Canada	923 908	1 058 486	— 134 578
Western Canada	336 147	145 064	+ 191 083

The exports of hog products from Canada have, until quite recently, almost entirely to Great Britain. With the coming into force of the son-Underwood " Tariff in September, 1913, the markets of the United

(1) A large number of swine are slaughtered in Canada in places other than those federal inspection.

States of America were thrown open to meat products on a free basis. Sin that time increasing quantities of Canadian bacon, hams and pork have be finding their way over this international boundary.

Pedigree Registration.

The registration of swine in Canada commenced with the Be shire breed in 1875, but it was not until 1882 that other breeds commen to be recorded. That year, a record was opened for Suffolks, Yorksh and Tamworths, and at various periods up to 1892 practically all of the p ent breeds in Canada, with the exception of the Hampshires, were be recorded; Hampshire records were opened in 1910. The work of regist tion was carried on by the Agriculture and Arts Association of Ontario about the year 1900, when that body ceased to exist. From that time u the National Live Stock Records were formed in 1905 (under the I Stock Pedigree Act of 1901) the work of registration was done by the Henry Wade, Secretary of Live Stock Associations in Ontario.

Since 1905 the registration of swine in Canada has been carried on un the National Live Stock Records System at Ottawa.

The development of a Canadian "bacon" hog is strikingly refle in pedigree registration. During the past thirteen years hogs of breed the "bacon" type have increased by leaps and bounds, those approac that form have more than held their own, while certain breeds of the sl thick type have passed off the stage so far as registration in Canada is cerned. The following table shows the number of pedigrees of each o several breeds that have been recorded up to 1900, the number of eac corded up to the beginning of 1914 and the number of each recorded the beginning of the present century:

Pedigree registrations:

	Up to 1900	Up to 1914	No. since 1900
Berkshire	12 147	29 350	17 293
Yorkshire	6 681	46 393	39 712
Tamworth	2 398	10 063	7 665
Chester White	2 519	11 420	8 901
Duroc Jersey	706	2 363	1 657
Poland China	2 595	3 878	1 283
Hampshire	—	933	933
Essex	20	272	252
Suffolk	262	281	19
Victoria	14	—	—

Pure Bred Swine in Canada.

The following table compiled from Canadian Census returns of 1911 ws the numbers of pure bred swine in Canada, by provinces, in June of year:

Breeds	Alberta	British Columbia	Manitoba	New Brunswick	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan	Canada
shire	1 771	342	1 995	235	187	7 455	246	740	918	13 889
ter White	23	39	62	301	52	1 665	112	1 901	42	4 197
e Jersey	214	2	33	—	12	436	1	22	10	730
. . . . .	—	15	—	—	—	31	—	—	—	46
shire	2	70	20	1	—	664	4	153	2	916
l China.	215	5	145	—	4	388	—	120	93	970
. . . . .	—	—	2	—	—	4	—	5	—	11
orth , ...	141	53	363	41	—	2 996	1	634	64	4 293
hire.	2 120	386	2 385	775	353	15 459	603	4 013	1 635	27 729
pecified.	108	255	532	112	33	1 755	42	696	113	3 666
Total . . .	4 594	1 167	5 537	1 465	661	30 853	1 099	8 284	2 877	56 447

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

806 – **Courses of Instruction for Teachers in Rural Continuation Schools in Prussia.** — *Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen*, Year Part 9, pp. 397-398. Berlin, June 1914.

Special courses were to be held this year in 19 places in Prussia for t instrction of teachers in rural continuation schools.

807 – **Recent Experience in Farming on Moors.** — *Communication from* Dr. Hj. Feilitzen, *Director of the Experiment Station of the Swedish Moor Culti Association.*

Among the recent works which deal with the nature of humic substa those of Baumann and Gully, Tacke and Süchting, Rindell, Os Schreiner (1), and Shorey deserve to be mentioned, and on the chemis of the nitrogen of moor soils the works of Jodidi, Suzuki and Valm

The formation of limonite and its explanation by Ad. Mayer Rindell led to a closer discussion of Haglund's so-called fire theory to the explanation of the origin of sphagnum moors through the destruct of the moor forests by fire (2).

On the growth of peat, recent investigations in Sweden have sh that in a moor 36 inches of peat have been formed since 1540. J. af Zell measured in one locality a yearly increase of 1 inch of light sphagn peat. According to Tolf this increase of peat on the surface of digg has no practical importance.

Concerning the chemical composition of various kinds of peat following works may be mentioned: Zailer and Wilk on pure sp peat; Gully on species of sphagnum and sphagnum peat; Paul on

(1) See No. 343, *B.* April 1913; also No. 311, *B.* April 1914.
(2) See No. 312, *B.* April 1914.

iphobe nature of sphagnum; and MINSSEN on the various kinds of

The writer's own investigations have shown that the moor water in ouched moors contains nearly one part of potash per 100 000.

As regards the microbiological properties of moor soils, KARSTEN Helsingfors has recently made experiments on the low power of conduct- heat of moor soils in a dry and moist state. Interesting also are the imum temperature readings which have been taken during the last years at Flahult 4 inches above the surface of the soil on different s near each other, over sandy soils, fens, and cultivated and unculti- d moors, in the months from May to October. They show what iderable differences of temperature different irradiation of the soil es in places quite close to each other.

)f great practical importance is the question of the draining of moor

On the moor at Flahult shallow drainage with ditches 2 feet deep 56 ft. apart, during five years, gave an average yield of hay 25 per higher than that obtained from land drained by ditches 4 ft. deep. shallow drainage the water-table stood, during the period of vegeta- (May to October), at an average of 22 inches below the surface of the le of the land between the ditches, while with the deeper drainage it at 26 inches. The fluctuations of the water-table were in general er with shallow than with deep drainage.

In experiments made in concrete basins in the experiment garden, constant heights of water-table (8, 16, 24, 32 and 44 inches), the grass in the first two years on sphagnum moor soil was highest when the r-table stood at 8 and 16 in. and decreased rapidly with the lowering e water-table. On the fen land the crop was heaviest with the water- at 16 and 24 inches.

In the second experiment farm at Torestorp, experiments have been urse for the last five years on the effect of varying distances (26, 40, d 80 feet) between drains at equal depths (4 ft.). Hitherto no notice- difference in the vegetation has been observed. The water-table everywhere about 36 inches below the surface. In this direction vations have recently been made also in Norway (Maeresmyren), ria (Bernau) and Esthonia (Thoma).

On the importance of damming up the water in the ditches on moors ican farmers in Michigan have collected evidence, and the Bremen on recommends the practice in moor drains. Count BERG, at Sagnitz nia), on the contrary, does not approve of it and recommends in- the use of heavy rollers to prevent the excessive drying of the surface or soil which has been rendered too loose by deep tillage.

The percolation of rainwater through well decomposed fen was found imeter experiments at Jönköping to be 90 per cent. on bare soil in inter half-year, and from 50 to 60 per cent on soil under vegetation. orresponding figures were 40 and 10 to 30 per cent during the summer ear.

For many years past a system of drainage has been practised Sweden much resembling Butz' wooden pipe drainage (1); this latter sys also has been used at Flahult with satisfactory results.

Experiments have been made during five years with lysimeters Jönköping on the quantities of plant food carried away from moor s by drainage water; they have shown that the losses on good fen land much greater in uncultivated than in cultivated soil, and in arable than under meadows. More lime and nitrogen are lost by unmanured th by manured soils. In the case of potash the losses were about the sa only traces of phosphoric acid were found. The losses of potash cau by manuring amounted to from 2.23 lbs. to a maximum of 12.49 lbs. acre per annum. The losses of lime reached 256 lbs. on arable land; 164 lbs. on meadows. A normal dressing of potash salts (38 per cent.) sho no increase of lime washed out over land without potash; this agrees the Bromberg results.

The question of liming moors has been very exhaustively treated DENSCH (2) at Bremen and by SJOLLEMA and HUDIG (3). Dr. NILSSON-E of the Swedish Seed-breeding Station at Svalöf, has demonstrated dry-spot disease (*Scolecotrichum*) (4) attacks the various kinds of oats different intensity and that greater or less resistance is hereditary; o varieties tested Improved Roslag and Mesdag were the most resis while Tartar Flag and Improved Dala were very susceptible. Accor to Dr. HEDLUND, *Scolecotrichum* does not attack oats, and probal saprophytic *Cladosporium* has been mistaken for it. The dry-spot dis or "Kalimangelkrankheit" (disease due to lack of potash) as Dr. Hed calls it, is probably caused by soil bacteria, as the plants are not atta by it when the soil has been sterilized, for instance with carbon disulp

That lime must be finely powdered in order to produce the best e has again been shown by recent experiments at Jönköping with pow lime of several sizes of grain, in the course of which experiments the powder (passing through a sieve of less than 0.2 millimetre mesh) ga heaviest yields (5).

Silicate of lime in Martin's slag proved almost equal to the carb

Among new implements for use on moors (6), the most imp are heavy cement rollers (7), motor ploughs, Banke's new Swedish m plough, Wassis and Hankmo Finnish harrows, the moor ploughs b the Norrahammer factory and Faxe's moor shoes for horses.

Concerning manures it has been observed at Flahult that far manure has a very feeble action during the first years of cultivat

(1) See No. 229, *B.* March 1913 and No. 1324, *B.* Dec. 1913.
(2) See No. 1243, *B.* Nov. 1913.
(3) See No. 345, *B.* April 1913.
(4) See No. 575, *B.* June 1914.
(5) See also No. 17, *B.* Jan. 1914.
(6) See also No. 760, *B.* Aug. 1914.
(7) See No. 1067, *B.* Sept. 1913.

soils; after some years its effect was decidedly better, but much or to that of artificials. On the peat soils of a better class the effect myard manure was more marked. A shallow ploughing in to a of two to four inches was better than to a depth of six inches. It was that for turnips it was better to apply farmyard manure in spring in autumn. The spreading of road sweepings is recommended by EIBER, and in Ontario, Canada, very good results appear to have been ned by a cartload of garden earth to the acre. Green manuring with upins gave very good results at Flahult; the residual effect was, how- very slight.

Among the bacterial cultures on the market, Azotogen and Kühn's gin in earth cultures have been beneficial on moor soils; on the con- liquid Nitragin proved uncertain. Earp-Thomas' Farmogerm (from nfield, N. Y.) had very little effect on yellow lupins. Inoculation had a good and certain action.

The question of the effect of Leguminosae on Gramineae in mixed crops een especially studied by TACKE, HILTNER, KASERER, LIFMAN, LYON, BIZZELL.

The investigations of BOTTOMLEY on *Myrica Gale* deserve to be men- d here.

HAGLUND, at the Jönköping Moor Experiment Station, tested the ts of artificials and lime on sphagnum and found that lime destroyed basic slag acted like lime but less energetically. Superphosphate sphagnum. Kainit was somewhat caustic, but without any special t, and nitrate of soda also acted weakly. The two latter, however, an indirect action, as they encouraged growth of algae and lichens thus hindered the formation of new shoots of sphagnum.

It is generally admitted that sedges dislike manuring, because manuring of meadows causes them to disappear; this is, however, the case and the apparent destruction of sedges is only due to their g smothered by the other plants. GÈZE, at Villefranche-de-Rouergue yron, France), has shown by direct manuring experiments, that es growing alone respond readily to phosphoric acid, nitrogen and sh.

At the Jönköping Moor Experiment Station experiments have been e for several years on the crops raised on the moors and on the quantities lant food removed by them from the various moor soils; two years the results were published in a voluminous report. There are some ations from WOLFF'S figures respecting certain plants, but in the main values agree well with the revised figures given by STUTZER in *Mentzel n Lengerkes landw. Kalender*. The writer's investigations did not him to confirm the high figures found by WAGNER and TACKE for amount of phosphoric acid contained in hay; the figures found by STENSEN in Denmark, LENDE NJAS in Norway, and KRÜGER and STUT- in Germany, agree with those of the writer.

Among the different phosphates Palmaer phosphate proved equal superphosphate. Basic slag was tested in two series of experiments,

and its total effect, lasting three or four years, turned out clearly supe to that of superphosphate. In the Danish field experiments superphosph and basic slag proved of equal value on field crops, but on meado the former was somewhat superior. The after effects of basic slag w better than those of superphosphate. In moist years basic slag act better than in dry ones. Bone meal behaved almost as well as sup phosphate on acid moor soils, but badly on alkaline soils. Tunis pla phates, on newly cultivated moor land at Flahult, in two years of expe ment, gave only one half the effect of basic slag. Vivianite proved almo as good as basic slag.

As for potash manures, the effect of phonolite (1) was only half th of Stassfurt salts.

Among recent experiments those with "Elektrokali" (2) and Jaq ner's carbonate of potash, as well as those on the substitution of pota by soda, and the works of WHEELER, SCHULTZE, WOHLTMANN and SÖG BAUM on the effects of common salt deserve to be mentioned.

CROPS AND CULTIVATION.

808 – **An Improved Co; Psychrometer.** — SHAW, H. B. (Bureau of Plant Indu U. S. Dep. of Agr.) in *The Plant World*, Vol. XVII, No. 6, pp. 183-185. Balti Md., June 1914.

A psychrometer (*i. e.* an instrument used by the U. S. Weather Bur for measuring the relative humidity in given localities) is described wh is designed for use amongst foliage and differs from other psychromet in being provided with a protecting device preventing entanglement w the foliage while the thermometers are being whirled.

809 – **Distribution of Soil Particles.** — BEDFORD, DUKE OF, and PICKERING, S. U *Fourteenth Report of the Woburn Experimental Fruit Farm*. London, 1914.

The distribution of the clay particles in a soil was determined i series of experiments, carried out during a period of 14 months, in orde estimate the influence of the rainfall on such distribution. From a of ground 4 yards square which had received moderate dressings of artif manures for the last 18 years, samples were drawn once a month in t layers of 6 in. each down to a depth of 18 in. The samples were air-d sifted, and dried at 100° C.; then 40 gms. were shaken up with 40 of water for 24 hours; after being allowed to settle, 200 cc. of the soln were syphoned off and its clay content was estimated. The results obta for the top 6 in. of soil are given below, together with the rainfall for 20-day period preceding each sampling:

(1) See Prof. LEMMERMANN'S article, in *B.* Oct. 1913, pp. 1486-1489; also No *B.* March 1913 and No. 500, *B.* June 1914.

(2) See No. 420, *B.* May 1914.

Month	Clay in uppermost 6 in. of soil		Rainfall during previous 20 days. in.
	per cent of soil. "Absolute"	per cent of total clay throughout the 18 in. of soil. "Relative"	
ril.	0.52	23	1.35
	0.31	9	0.48
	0.26	11	1.21
	0.38	21	1.36
	0.50	24	2.08
	0.47	18	1.49
ust	0.44	24	2.01
	0.56	29	1.70
	0.52	17	1.35
	0.31	16	0.68
	0.20	13	0.27
	0.40	20	2.33
	0.25	8	1.11
	0.46	18	2.65

The fluctuations in the "relative" clay content of the top layer of soil closely those of the rainfall except during the month of February when id is in an abnormally wet condition owing to the accumulation of nter rainfall. If the "relative" proportion of clay in the top 6 in. of soil culated on the two topmost layers alone, instead of on the whole of 18 in., then the figures, though following the rainfall fairly well, do so as well as when the proportion of clay in the topmost 6 in. of soil sidered in relation to the three layers; and from this it would appear he effect of the rain on the clay particles extends below the top 12 in. he total "absolute" amount of clay in the 18 in. is by no means constant; ould indicate that the alteration in the proportion of the clay in the most layer is not due to differences of distribution, but rather to culation and flocculation caused by the rain; on the other hand, as the olute" amounts of clay in the top layer do not follow the fluctuation rainfall as closely as the "relative" amounts, it would seem that h the flocculation and deflocculation are perhaps the most important s of the rainfall, they are not the sole ones, and that some redistribution e particles also occurs.

The Number and Growth of Protozoa in Soil. — SHERMAN, J. M. (University f Wisconsin), in *Centralblatt für Bakteriologie, etc. II Abt,*. Vol. 41, No. 18/23. p. 625-630. Jena, July 22, 1914.

Sixteen soils from Wisconsin, Virginia and Tennessee were examined rotozoa by the dilution method, soil extract being used as the growing dium. It appeared from the results that all the soils contained at least

1000 protozoa per gram and that most probably even 10 000 per gram wo still be a conservative estimate. Nearly all the organisms found were gellates, but *Colpoda cucullus* and *C. steinii* occurred in two of the dilutions and *Balantiophorus elongatus* in one of them. No amoebae found.

Sterilized soils were also inoculated with normal soil, proving g culture media even with a somewhat subnormal moisture content. A 15 days flagellates had multiplied in some cases to the extent of 100 per gram of sterilized soil ; ciliates on the other hand made no growth

811 – **Relation of Bacterial Transformations of Soil Nitrogen to Nutritio Citrus Plants.** — KELLERMAN, K. F., and WRIGHT, R. C. (Bureau of Plant ind try, U. S. Dep. of Agr.) in *Journal of Agricultural Research*, Vol. II, No. 2, pp. 101- Washington, D. C., May 1914.

The writers analysed the soils of certain citrus groves suffering fr chlorosis in California and carried out greenhouse experiments in Wa ington, D. C., from which they obtained evidence that the falling in yield of the citrus groves may be due to the toxic effects of su abundant nitrates.

812 – **Improvement of Waste Land in the Netherlands.** — MÜLLER, A., in *Deu Landwirtschaftliche Presse*, Year XXXI, No. 57, pp. 701-702. Berlin, July 1914.

1. *Generalities.* — In the Netherlands the improvement of wa lands commenced in the first few decades of last century with the afforest tion of heaths by individual landlords ; some of these now form gro of fine closed woods. The growing interest in the improvement of unp ductive lands led the parties concerned to the foundation of the He Improvement Society in 1888. At first the State limited its action to encouragement of private undertakings and to the fixation of cer shifting dunes which were a menace to the community. It was only in 1 after the institution of a special Forest Service, that the State bega purchase large extents of waste land and to put them under cultiva It dealt chiefly with lands the improvement of which was impor for the neighbouring cultivated areas but not suitable for private e prise. At present the State Forest Service possesses 46400 acres of land and 12850 acres of cultivated land against 26 000 and 6600 in year 1899. Further, the State assists the Communes in their work o provement of waste lands by granting loans free of interest and b technical direction of the work ; the Heath Improvement Society al ceives yearly State grants for the promotion of drainage schemes an holding public courses in forestry.

2. *Treatment of heaths.* — *a) For permanent agricultural utilizatio* The first operation generally consists in working with a steam p to a depth of 6 to 12 inches ; occasionally in uneven soils the spade is Then follows manuring, for instance with 6 to 8 cwt. per acre of basi and kainit, and yellow lupins and serradella are sown for a year or According to position and soil, oats and rye or potatoes and even or peas are then grown. If the heath is suitable for meadow or pa

loughing is only 6 or 8 inches deep and is followed by harrowing. due drainage and levelling of the inequalities of the surface the soil is red; moor soils are frequently covered with a layer of sand 2 to 4 s deep; grass and clover are then sown, often under oats or rye, ometimes after potatoes.

b) For reafforestation. — The areas suitable for forests are ploughed lepth of about 16 inches, and where necessary drained by open ditches manured with artificials and green manure crops (yellow lupins). are then mostly put under rye for one or two years (sometimes ser- la is taken with it) or, on low-lying land, under oats. After this pre- ion one-year-old pines are planted at distances of 24 to 30 inches way. If the locality is suitable, oak, elm, alder and other trees are planted in clumps or as borders.

3. *Fixation of shifting sands.* — While the heaths occupy about a million , the sands cover only about 125 000 acres. About seven-tenths of are maritime dunes. Considering the importance of this area for ulture, the State has taken possessions of four-tenths of the coast s and three-tenths of the inland ones. In the districts of Haarlem and Hague some large dune areas have been afforested by private owners.

a) Inland shifting sands. — After roughly levelling the greatest ualities of the surface of the sandhills the ground is partially or wholly ghed to a depth of 12 to 20 inches. Then the soil is covered with cut h, marram grass, peat or the like, on which a shovelful of sand is wn at every step. Recently the areas to be afforested have been treated . various fertilizers, as well as with lupins, the straw of which has ed very useful for covering the soil. Two-year-old pines are then ted by means of iron planting-spades provided with a long and heavy le which ensures the long pine roots reaching to the moist subsoil.

b) Dunes. — For fixing the dunes the Dutch use chiefly marram s (*Ammophila arenaria*); plants preferably one or two years old are fully dug out and planted in clumps at distances of 20 in. × 20 in. slopes 12 in. × 12 in.). As soon as the condition of the soil allows Austrian, Corsican and mountain pine are planted. In sheltered spots ts pine is used with success, as well as pitch pine (*Pinus rigida*) and some moist places oaks and alders. Where conditions are favourable possibility of agricultural work is not neglected. Thus, for instance, the island of Texel, where for a long time sheep breeding has been ctised on a large scale (about 30 000 lambs are exported every year), most sheltered dunes have been devoted to grazing purposes.

- **A New Way of Utilizing the Energy of Peat Beds.** — ZAILER, V. in *Zeitschrift für Moorkultur und Torfverwertung*, Year XII, Part 3, pp. 89-91. Vienna, 1914.

In order to utilise the quantities of energy latent in peat beds, the struction of large central electric stations has been undertaken. These ks burn only dried peat. This is done in two different ways: the peat ither burnt directly in the fire-box of steam boilers and the steam is used drive turbine dynamos, or it is burnt in gas generators and the gas used

in motors which transform the energy into electricity. Some of the generators obtain sulphate of ammonia as a by-product.

Of late another method has been adopted, to a certain extent combining the advantages of the two systems, and giving a still better utilisation of the energy contained in the fuel. This is the flameless surface combustion of generator gas under steam boilers. The process was invented at the same time in England and in Germany. It consists in leading a mixture of gas and air under low pressure through a certain mass of fuel which melts only at an exceedingly high temperature. In the interior of the mass an incandescent nucleus is formed which irradiates heat without forming flames. In England some boilers fired with this system have worked uninterruptedly for upwards of nine months, using water gas or coke gas. Any other similar gas can be used equally well. Whilst formerly it was considered satisfactory to produce 8 to 9 lbs. of steam from 1 sq. ft. heating surface, with this method as much as 21.5 lbs. of steam can be produced from the same surface.

From the point of view of the exploitation of moors it is of great importance that no other fuel need be brought to heat the boilers.

The writer is of opinion that if this invention fulfils its promise a great step will have been made towards the solution of the problem of utilizing the energy latent in peat beds.

814 – **Influence of Lime on Soil Bacteria.** — MILLER, F., in *Zeitschrift für Gärungsphysiologie*, Vol. IV, Part 3, pp. 194-206. Berlin, April 1914.

The writer contributes to the discussion of the question already examined in various quarters as to the influence of the compounds of lime upon the multiplication and the vital activity of soil bacteria. In the experiments the rather heavy soil of the experiment field of the Agricultural and Bacteriological Institute of the University of Göttingen was used. The soil was taken from the field when it was damp ; it was then sifted and thoroughly mixed. The additions were calculated on the dry earth. The quicklime was added in a finely pulverized state and well mixed with the soil. It contained only 4.16 per cent. of CO_2. The soil under examination contained 2.02 per cent. of CaO and 1.19 per cent. of CO_2. An addition of 5 per cent. CaO made the soil noticeably warmer and additions of 1 and 5 per cent. increased the loss of water from the soil. The experiments led to the following principal results :

1. Additions of 0.3, 0.5 and 1 per cent. CaO caused at first a striking decrease in the numbers of bacteria and later an immense increase. The greater the addition of lime the longer the duration of the decrease but also all the more intense the increase when it finally set in.

2. The addition of 5 per cent. CaO hindered completely the growth of bacteria.

3. Quicklime in doses of more than 0.05 per cent. on loam rich in lime caused a reduction of nitrification. Doses of 0.01-0.06 per cent. on Bunter sandstone poor in lime have a stimulating effect in this direction.

4. Additions of quicklime up to 0.1 per cent. on sandy soils rich

in lime diminished the formation of nitrate from ammonium sulphate, doses of 0.5 per cent. CaO stopped this process altogether.

Experiments on the Value of Nitrate of Guanidin and Nitrate of Urea in comparison with Nitrate of Soda and Nitrate of Ammonia. — WAGNER, P., in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year XXIX, Part 29, pp. 417-421. Berlin, July 18, 1914.

At the request of the German Agricultural Society's Committee on Ma- s the writer has tested the manurial value of nitrate of guanidin and of ate of urea, two new products derived from calcium cyanamide, which it pped can be placed upon the market at suitable prices. Samples of the two , the former containing 40.29 per cent. and the latter 30.54 per cent. of ogen, were obtained by the writer from the " Oesterreichischer Verein chemische und metallurgische Produktion " of Aussig on the Elbe. The eriments were made on oats and French ryegrass.

1. *Experiments on oats.* — Fifty-two pots were used, each of them aining 46 lbs. of sandy soil of the following composition :

	per cent		per cent
nd clay	20.6	Carbonate of lime.	0.02
sand.	19.4	Phosphoric acid	0.148
e sand	50.1	Potash.	0.076
l.	9.9	Nitrogen.	0.079

TABLE I

Manure	Dates of manuring			Total grams of nitrogen
	April 17, grams of nitrogen mixed with soil on sowing	May 21, grams of nitrogen dissolved in 1 litre of water and poured on soil	May 28, grams of nitrogen dissolved in 1 litre of water and poured on soil	
—	—	—	—	—
Nitrate of Guanidin	1.0	—	—	1.0
	1.0	—	—	1.0
	1.0	—	—	1.0
Nitrate of Urea	1.0	—	—	1.0
	1.0	0.5	—	1.5
	1.0	0.5	0.5	2.0
Nitrate of Soda	1.0	—	—	1.0
	1.0	0.5	—	1.5
	1.0	0.5	0.5	2.0
Nitrate of Ammonia	1.0	—	—	1.0
	1.0	0.5	—	1.5
	1.0	0.5	0.5	2.0

The four manures were given in doses of 1.0, 1.5 and 2.0 grams nitrogen per pot. Each pot also received 5 grams of phosphoric acid in the form of basic slag, and 2 grams of potash as silicate of potash.

Table I gives the scheme of the experiment; Table II shows the results expressed as average increase in dry matter over the average of the control pots, which was 20.2 gms. of straw and 6.2 gms. of grain.

TABLE II.

Nitrogen given under the form of:	Increase in yield of straw due to manuring with			Increase in yield of grain due to manuring with		
	1 gr N	1.5 gr N	2.0 gr N	1 gr N	1.5 gr N	2.0 gr
Nitrate of soda . . .	86.9	104.1	113.4	46.3	70.8	76.
» of ammonia .	85.7	101.9	100.0	42.1	64.7	71.
» of urea . . .	62.2	81.8	97.1	37.8	54.8	67.
» of guanidin. .	33.6	—	—	26.8	—	—

Taking the yields obtained with nitrate of soda as 100, the following relative values are found:

	grain	straw
Nitrate of guanidin.	39	58
» urea.	72	82
» ammonia	99	91
» soda.	100	100

2. *Experiments with French ryegrass.* — For these experiments 52 pots were used. The soil was the same as that for the experiments on oats. As basal manure 5 gms. of phosphoric acid as basic slag and 2 gms. potash as silicate were mixed with the soil. To these amounts some more potash was added for the second cut and some phosphoric acid and potash for the third cut, so as to keep pace with the development of the plant. Three cuts were made. The manures under comparison were given in the preceding experiment, but only to the two first cuts, the third getting no nitrogen.

The injurious effect of nitrate of guanidin observed in the experiments with oats was not noticeable in these tests. The sum of the average increases given by the three series (2,3 and 4 gms.), expressed as dry matter in the three cuts, was as follows (control 18.3 gms.);

	gms
Nitrate of guanidin.	312.0
» urea.	350.9
» soda.	358.8
» ammonia.	365.1

If the increase obtained with nitrate of soda be taken as 100, the follow- relative values are obtained :

Nitrate of guanidin.	87
» urea.	98
» soda	100
» ammonia	102

The writer concludes from these experiments that nitrate of urea can be mmended to farmers as a useful manure, provided the nitrogen in it old at about 20 per cent. cheaper than the nitrogen in nitrate of soda. loes not seem advisable to produce nitrate of guanidin as a commercial ogenous manure, as its effect was inferior to that of the other three ates and in the experiments with oats it was observed that this nitro- compound was not favourable to plant growth.

- The Relation of Atmospheric Evaporating Power to Soil Moisture Content at Permanent Wilting in Plants. — SHIVE, J. W, and LIVINGSTONE, B. E. (Botanical contribution from the John Hopkins University, No 37) in *The Plant World* Vol. XVII, No. 4, pp. 81-121. Baltimore, Md., April 1914.

In their investigations on the point of permanent wilting in plants, IGGS and SHANTZ (1) showed that the moisture content of soils where this nt had been reached was the same when the experiments were carried in a damp chamber or in an unshaded green-house. CALDWELL, on the er hand, only obtained moisture residues similar to those calculated m the Briggs and Shantz formula when he grew his plants in a moist mber. The present investigations were undertaken to determine the ct of the evaporative power of the atmosphere on the soil moisture ntent at the permanent wilting point. To this end plants were tested ler five different conditions of atmospheric humidity : *a*) in the open , exposure I ; *b*) in a cheese-cloth shelter, exposure II ; *c*) in a lath shelter de of laths 3 cm. wide with 3 cm. spaces between the laths, exposure ; *d*) in a cheese-cloth shelter placed inside the lath shelter, exposure IV ; l *e*) in a glass chamber protected from direct sunlight and kept saturated wet cloths, exposure V. The evaporation rate in each exposure was ermined by means of a porous cup atmometer. The experiments were ried out at the Desert Laboratory of the Carnegie Institute, at Tucson, zona, in July-September 1913. Maize, *Phaseolus vulgaris* and *Capsi- n annuum* were used as test plants ; the soils employed consisted a mixture 25 or of 50 per cent. of a local clay loam with a coarse river d, or of the clay loam used alone.

The results are summarised in the table on the next page.

These results confirm those of Caldwell in that the higher the rate of poration, the higher the water content of the soil at the wilting point. here the soil employed consisted of a mixture of sand and loam the lues actually obtained for soil moisture were all higher than those culated from the Briggs and Shantz formula, but where the pure loam

(1) See No. 20, *B.* Jan. 1914. (*Ed.*).

Test Plant	Exposure	Evaporation from atmometer cc. p. hour.	Soil used	Water content of soil at the permanent wilting point		
				actual	calculated from Briggs and Shantz formula	ratio actual / calculated
Maize	V	0.3	25 % loam	4.30	3.80	1.1
	IV	1.5	75 % sand	5.48	»	1.4
	III	2.4		5.78	»	1.5
	II	3.0		6.04	»	1.5
	I	3.7		6.16	»	1.6
Phaseolus	V	0.2		4.70	»	1.2
	IV	2.3		5.36	»	1.4
	II	3.0		6.22	»	1.6
	III	3.6		5.73	»	1.5
	I	4.8		6.35	»	1.6
Capsicum	V	0.5		5.13	»	1.3
	IV	2.2		5.41	»	1.4
	III	3.2		5.85	»	1.5
	II	3.9		6.59	»	1.7
	I	6.1		7.17	»	1.8
Phaseolus	V	0.2	50 % loam	5.90	5.92	1.0
	IV	2.0	50 % sand	7.85	»	1.3
	III	3.3		8.16	»	1.3
	II	4.5		8.27	»	1.3
	I	5.8		8.37	»	1.4
Maize	V	0.1	100 % loam	10.99	12.52	0.8
	IV	0.6		11.89	—	0.9
	III	1.8		12.03	—	0.9
	II	2.6		12.95	—	1.0
	I	3.9		13.13	—	1.0

was employed the ratio actual: calculated started well below unity and only rose with increasing evaporation to a maximum of 1.05.

The writers discuss the interpretation of their results by means of formula.

- **The Distribution of Stomata in the Seedlings of Some Gramineae.** — ZAEPFEL, EDGAR, in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 159, No. 2, pp. 205-207. Paris, July 13, 1914.

The writer has observed that in oats (*Avena sativa*) and in wheat (*Triticum vulgare*) the stomata are most numerous at the apex of the cotyledon, less numerous in the subapical belt and absent at the base of the cotyledon, while in *Panicum altissimum* and *Paspalum stoloniferum* stomata exist throughout the length of the cotyledon and are not more numerous towards the apex.

Summarizing, in the Graminee examined, stomata are absent in the hypocotylous belt, which is incapable of heliotropic perception. In the cotyledon of oats and wheat stomata abound at the apex, where the heliotropic sensibility is great. Stomata exist also, though in much smaller numbers, in the subapical belt, which possesses only a weak capacity of perception. In the cotyledon of *Panicum* and *Paspalum* the stomata exist throughout the whole length, and the cotyledon is wholly sensible to light. The conclusion may therefore be drawn that in the Gramineae examined the abundance of stomata in young plants corresponds to their degree of heliotropic sensibility.

- **The Resistance of Wheats to Winter** (1). — HITIER, H., in *Journal d'Agriculture pratique*, Year 78, Vol. II, No. 29, pp. 82-84. Paris, July 16, 1914.

Last winter M. Schribaux made observations on the resistance to cold of various wheats at the Paris Seed Trial Station and in the field devoted to collections belonging to the Agricultural Institute. The following points were noted.

The varieties from Algeria and the extreme south of France and the durum wheats (Touzelle de Provence and Richelle of Naples) were completely destroyed. Then follow in increasing order of resistance: wheat from the Landes, Rieti, Belótourka, Polish wheat, Black Russian Petanielle, Japhet, Bordeaux, Autumn Saumur, Saint Laud, Noé, Gros-Bleu and Pithivier derived from Bordeaux). The hybrids Rieti × Japhet obtained by Schribaux proved decidedly less sensitive to the cold than their parents. Among the English wheats (which stood the winter well) Hunter's was the most resistant.

Among the rivetts, Nonette de Lausanne showed great resistance, but of all the wheats examined, Alsatian wheat and the hybrids obtained from them by M. Schribaux (Red Alsatian × Bordeaux and Red Alsatian × Dekat, varieties which are now well fixed) are those that stood the cold best.

According to observations in several parts of France, M. Hitier believes that the damage done to the wheat by frost depends more upon the nature and physical condition of the soil than upon the varieties of wheat used. On heavy soils which had been beaten down by rain all the varieties suffered, while they resisted in permeable soils and in those that had not been compressed.

The greater susceptibility to damage by frost cannot always be attri-

(1) See also No. 620, *B.* July 1914. (*Ed.*).

buted to late sowing, because in several cases the last wheats sown resi
much better than those sown first. On one farm in the departmen
Aisne and on another in Seine-et-Oise, it was observed that wi
overtaken by frost before it had completely sprouted out of the soil, g
very vigorously as soon as the thaw set in and did not suffer any furt
injury from the winter." Similar observations were made by M. Schrib
in 1891 and by others also.

It seems that there is a critical period in which wheat is specia
susceptible; it is when the radicle is ceasing activity and the adventitia
roots have not yet had time to develop; the result is a want of moisture
the leaves.

It may be said, in conclusion, that a whole series of causes exists, wh
we do not yet know completely and which render a wheat resistant
to cold.

819 - **Report on the Field Trials with Barleys organized in 1913 by th
ley- rowin, Station of the Brewers' Institute of Berlin.** — VON ECKENBREC
in *Deutsche Landwirtschaftliche Presse*, Year XXXXI, No. 50, pp. 625-628,
June 24, 1914.

The comparative trials carried out in 1913 by the Barley-growin
tion of the "Versuchs- und Lehranstalt für Brauerei" were intend
test the cultural value of various barleys for brewing purposes. The
made on 14 farms in North Germany, with the six following vari

1. Bethge's No. 2.
2. Mahndorf Improved Hanna (Strain C 8).
3. Heil's Improved Franconia.
4. Zeiner's Improved Franconia.
5. Ackermann's Improved Lower Bavarian "Danubia".
6. Ackermann's Improved Lower Bavarian "Bavaria".

Each variety was grown on at least two plots separated by plots
other varieties. No special manure was prescribed; in general, how
abundant quantities of potash and phosphoric acid were used with
moderate dressings of nitrogen. The seeds used were obtained direct
the breeders.

The examination of the product was restricted to the following po
protein content of the dry matter, thousand-grain weight, and gra
of the grain. The judges adopted the scoring usually followed in the
lin barley shows: protein content, weight and uniformity, ranging fr
point (bad) to 18 (superfine). The nature of the husk and the colo
the grain were also judged, 9 points being the maximum for the former
5 for the latter.

The results of nine complete trials may be summarized as follo

The highest average yield of grain was given by Zeiner's Improved F
conia, with 3130 lbs. per acre, but it was rather subject to smut and li
to lodge. It was followed by Ackermann's Danubia (very resistant
smut, but liable to lodge) with 3105 lbs. per acre, and by Bethge's N
(little subject to smut but a little inclined to lodge) with 3095 lbs. per a
The fourth place was taken by Heil's Improved Franconia with 3040 lbs.

; this suffered much from smut but stood up well. Ackermann's Ba-
, with 3030 lbs. per acre, possessed great resistance to smut and did not
e. Last of all was Mahndorf Hanna, which yielded 2945 lbs. per acre ;
s fairly resistant to smut but liable to be badly laid.
The points awarded to the above varieties for brewing quality were
llows :

Zeiner's Improved Franconia	60.1
Mahndorf Hanna	58.9
Heil's Improved Franconia	58.4
Ackermann's Bavaria	57.3
Ackermann's Danubia	54.4
Bethge's No. 2	54.3

- Field Trials of Vegetables: Four Years' Trials of Green Peas, 1909 to 1912. — SCHULTZE, W. — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 253, 69 pp. Berlin, 1914.

The four years' field trials of green peas (1909-12), carried out on several eriment fields in the most important vegetable-growing districts in many, were intended to test the respective merits of the various kinds peas as raw material for the canning industry, especially from the ner's point of view. Special importance was attached to the time of ening, to its duration, and to the stature of the plants, as dwarf vari-s that do not require staking are to be preferred for the smaller amount labour and material they require. Consequently early-maturing dwarf ieties were tried side by side with late-maturing tall ones. The pre-ation of the soil, sowing and cultivation were in every case carried out ording to local practice.

Results. — The yields of green peas are subject to much greater varia-ns than those of cereals or hoed crops. These variations are due partly differences in soil and weather conditions and partly to the varieties eas grown. In the eleven varieties tried there were striking differences tature, time of ripening and quality of the crop, so that in certain cases as difficult to decide which to prefer, as frequently a drawback in one nt was compensated for by an advantage in another. Some varieties, wever, possess a decided superiority, as may be seen from the following :

1. *Monopol*: plant of low growth (does not require staking), early ripen-; yield barely medium; ratio of the weight of the seeds to that of hulls good; size of the peas good (the peas are sorted by two es, one of 7 mm. and the other of 8 ½ mm. mesh; the larger peas are steemed for canning purposes).

2. *Stanley* : a marrowfat pea of low growth, very late ; yield and ratio eas to hulls low ; small peas too numerous.

3. *Express* : medium growth, very early, medium to good yield; satis-tory ratio of peas to hulls; size of peas satisfactory.

4. *Ueberreich* : medium to tall growth, early, low yield; medium ratio eas to hulls; size of peas unsatisfactory.

5. *Canning* : marrowfat pea, medium growth, late, low yield; good io of peas to hulls; small peas too numerous.

6. *Buchsbaum-Schnabel*: dwarf, very late, good yield, medium to goo ratio, very good size.

7. *William Hurst*; marrowfat pea, low growth, early, low yield, goo ratio, unsatisfactory size.

8. *Moringia White* (*Teutonia*) : marrowfat pea, low growth, very lat good yield, medium to good ratio, size poor ; very good for drying.

9. *Moringia Green* : marrowfat, medium growth, late, medium yiel good ratio, poor size.

10. *Grünbleibende Folger*: tall, mid-season, good ratio, average siz

11. *Improved Schnabel*; tall, mid-season; yield, ratio, and size very good.

From the above it is evident that there are dwarf varieties th yield well and possess a good ratio and well formed peas. In general t early varieties have lower yields than the mid-season and late one but they are less exacting as to soil and moisture. Owing to the shorter life the moisture they require when sown early is generally pr vided by the winter rainfall, which is not the case with later varieties, t yield of which is often endangered by dry weather, especially on light soi The chief aims of practical plant breeding are thus seen to lie in the rection of combining early maturity with satisfactory yield.

The flavour of the peas is less dependent upon the variety grown th upon the weather and perhaps the soil and its state of cultivation.

821 – **Physiological Correlations and Climatic Reactions in Alfalfa Breeding.** - FREEMAN, G. F. (Agricultural Experiment Station, Phoenix, Arizona) in *The Americ Naturalist*, Vol. XLVIII, No. 570, pp. 353-368, Lancaster, Pa., June 1914.

During the season of 1910, 44 varieties of alfalfa were grown at th Arizona Experiment Station Farm; they were irrigated at the rate of ov 6 in. of water for each cutting, and 6 cuttings were obtained during th season ; these were studied with regard to yield and character of the ha and other points.

The correlation between the yield obtained at the first and subsequen cuttings takes the form of a curve beginning and ending high with a sag the middle, which indicates the presence of some disturbing factor special noticeable at the fourth and fifth cuttings, and which appears to be the hig temperature together with a slight deficiency of water. The presence this factor is again evident in the disturbance of the normal correlation b tween the yield and the stand (number of plants on a unit area) at t fourth and fifth cuttings.

The 44 varieties are classified according to their morphological chara ters and geographical origin into the following groups: Mediterranea Peruvian, European, American and Turkestan. The reaction of the d ferent groups to the climatic conditions of Arizona is shown by plotti the differences between the average yield of each group and the to average yield at each cutting. The curves thus obtained show that the is a marked similarity between the European and Mediterranean alfalfa though the better stand of the European varieties makes thes yield alwa better than the yield of the Mediterranean ones; European varieties yi

largest relative crops at the fourth cut and then go off rapidly. urves of the American and Turkestan groups are again much alike, urkestan being slightly above the American strains ; the yields of groups decrease earlier than the European varieties. The Peruvian on the other hand are by far the best croppers at the end of the

n.

)ther correlations show how the nitrogen content of the hay is depend- n the high proportion of leaves in the hay and on the composition of aves, but that the stand of the plant has no effect on the proportion ves in the hay, though this is always low when the plants are tall or e total yield of hay is high. Negative correlation was also shown between the height of plants and their stooling capacity (average of stems per acre).

e **Value of Turkestan Lucerne.** — BOHUTINSKY, G., in *Monatsheft für Land-* *ar*, Year VII, Part 3-4, pp. 75-81. Vienna and Leipzig, 1914.

ing to the increasing importation of Turkestan lucerne seed into comparative tests were made in the experiment field of the Royal ural College at Krizevci between this seed and the Hungarian, the most important in Croatia. The soil is a heavy loam, contain- 1 0.4 to 0.9 per cent. of lime ; owing to its tenacity and capacity r and to the abundant rainfall it is not the most suitable for growing Nevertheless lucerne persists for five or six years, yielding from five cuts per year on land subjected to garden cultivation during preceding years, as was the case with the area on which the experi- is conducted.

ch variety of seed was examined as to its germinating capacity n sown at the rate of 45 lbs. per acre on two plots each measuring yds. As a cover crop a thin sowing of four-rowed barley was The barley was sown first ; then the land was thoroughly harrowed April 8,1909, the lucerne was sown. It came up well on the 14th. wth of both kinds was normal and when the barley was harvested 18 they did not differ from each other in appearance. Only later, h plots, the Hungarian lucerne grew more rapidly and intensely eady in the first year yielded a considerably heavier crop than the ariety.

e experiment was continued during the three following years. to the slower growth of the Turkestan lucerne the plots under this showed the very first year many more weeds than the other ones. o varieties passed the winters 1909-10 and 1910-11 equally well, ring the winter 1911-12 the Turkestan lucerne, which was already in towards the end of 1911, fell off further. In the spring of 1913 so thin that the plants could have been counted. On the other he Hungarian lucerne presented a completely closed surface.

1910 the first cut was made on both varieties at the same time, ceeding two cuts when each variety was in bloom. The yield out equal, especially because the weeds also contributed to increase lk of the Turkestan plots, and also because the first cut was somewhat

too late for the Hungarian variety. In 1911 the cuts were made when lucerne began to bloom; the result was that it gave five cuts with a consi ably heavier yield than the Turkestan, which allowed of only four c In 1912 both varieties were cut four times. The first cut of Turkes owing to the grass and weeds it contained, was more abundant than Hungarian. In the other three cuts only the lucerne plants were weig in the second cut the grasses and weeds made nearly half. On the w the yield of the Hungarian lucerne during the four years exceeded of the Turkestan by 53 cwt. per acre, notwithstanding the fact that i latter grasses and weeds were included except for the last three cuts of t

The chief result of the experiment was the demonstration of the slower aftergrowth of the Asiatic variety. The writer does not draw conclusion regarding its shorter duration, as its slower growth favour development of other grasses and this fact alone may lead to the e disappearance of the lucerne. Its slowness of growth is alone enou condemn it as unsuitable for leys.

In order to prevent the trade in this variety, the writer propose the seller should be always obliged to declare the origin of certain in varieties and that the seed control stations should no longer seal the containing it: the Hungarian stations have since 1909 stopped sealin packages of this variety and have succeeded in the object aimed at.

823 – **Connection between Available Space, Weight and Sugar Content of and Mangolds.** — MUNERATI, O., MEZZADROLI, T., and ZAPPAROLI, F. V. *lettino dell' Associazione italiana delle Industrie dello Zucchero e dell'Alcool*, Y No. 1, pp. 6-12. Bologna, April 1914.

In the experiments conducted during 1912 and 1913 three groups formed: one consisted exclusively of sugar beets, the second of man and the third of a mixture of the two. They were sown in a field and in 6 ft. 6 in. square by 3 ft. 3 in. deep containing different kinds of The seeds were all of the same kind, and were sown on the same day. results are summarised as follows:

1. Between the available space for each plant and the weig individual beets there is no constant connection. While usually beets plenty of available space are larger, yet very fine beets are also found the plants are close together, and the reverse also is often the case.

2. The weight which some beets attain depends markedly up soil and, in equal soils, upon the season.

3. Exceptionally large beets occur much more seldom when have much available space upon poor soil than upon a rich one.

The above observations are equally true for beets, mangold semi-sugar beets.

4. Mangolds growing near beets do not affect the develo of the latter.

5. Even in the most uniform soil imaginable (such as that boxes) and with the same treatment, the same variations and diffe occur.

6. The differences between individual plants growing in the

ons of soil appear also in the shape of the roots and behaviour of
root.

7. Even in sugar content noticeable differences are observed in beets
in the same soil. Not only does the percentage of sugar vary
ng to the weight and form of the roots, but beets of the same weight
m and growing in the same soil during the same period may present
markable differences in the percentage of sugar they contain.

offee Cultivation in Uganda. — SMALL, W. (Department of Agriculture, Uganda) *Bulletin of the Imperial Institute*, Vol. XII, No. 2, pp. 242-250. London, April-
e 1914.

ffee is the staple crop of European planters in Uganda; exports
sen from about 10 tons in 1908 to 167 tons in 1912-1913, and are
ing as the estates gradually come into bearing; the exports for the
hs ending December 31, 1913, were double those for the whole pre-
year. There were 4 568 acres under coffee and 2 659 acres under
and coffee in March 1913.

ie indigenous coffee plant is *Coffea robusta*, but this is only cultivated
natives and consumed locally; Europeans plant the so-called Nyasa-
nd Bourbon varieties, said to have been imported from Jamaica
len respectively and both derived from *C. arabica*. Little care has
ken so far with seed selection, but both these varieties thrive well and
eavy crops the fourth year. The outbreak of coffee leaf disease at the
1912 and the epidemic in 1913 led planters to give some attention
er forms of coffee, and experiments are now being carried out with
rica, *C. stenophylla* and *C. robusta*. With regard to climate, soil and
e, Uganda is eminently adapted to the production of coffee.

ne question of permanent shade in coffee plantations is still in the
mental stage; results obtained up to the present have not been fa-
le to permanent shading, but the matter has not yet been given a
ntly extensive trial. The silky oak (*Grevillea robusta* A. Cunn.) is
tested for this purpose and various species of Leguminous trees, also
ubber trees which have the advantage of being profitable and the
antage of being subject to a root disease which also attacks coffee.
uestion of cover crops is also being investigated.

he strong, steady winds which occur periodically in certain parts of
untry have to be guarded against, and high or low wind belts can be
with various trees, bananas being a favourite subject as they provide
or the native population at the same time.

Hemileia disease is endemic in Uganda and its apperance in the form
epidemic in 1913 may be attributed to the fact that it was suddenly
led with a new host plant; despite the prevalence of this disease,
utlook is favourable, for the indications are that its virulence will
s in the future than in the past; the fungus, being endemic in Uganda,
t be expected to work the havoc that it has wrought in other countries
hich it was introduced. Planters are recognising that much depends
eir efforts to eradicate it, and the Department of Agriculture is alive

to the situation. In dealing with white ants (termites), extermin have been used with success. The ravages of these pests are unequal in some parts they have caused little or no damage to growing plar

825 – **Production of Vanilla in the French Colonies.** — *Ministère des Colonie letin de l'Office Colonial*, Year 7, No. 77, pp. 209-249. Melun, May 1914.

Martinique. — Vanilla was introduced into this colony a long ago (about 1697), but its cultivation has not spread much and it at present to remain stationary. During the four years from 1908 to the greatest exportation took place in 1909 (4 590 lbs., worth about £ the least in 1911 (2536 lbs., worth about £955).

Guadeloupe. — *Vanilla planifolia* was introduced in 1701; art pollination was begun in 1839, and a few years later the exportation nilla began; in 1911 it amounted to 39 267 lbs., of the value of £1 The greatest quantity was exported in 1908: 68 242 lbs., worth £1 Besides Mexican vanilla (*V. planifolia*), the native vanilla (*V. pomp* also grown to some extent.

Guiana. — *Vanilla planifolia* was introduced about the year 1870 Administration of the penal settlement, but it dit not gain a footin its cultivation is now abandoned.

Gaboon. — The cultivation of *V. planifolia* has developed gra during the last fifteen years. The vanilla exported in 1911 was 89 worth about £1102. Vanilla has often been found wild in both French and Belgian Congo.

Mayotte and dependencies. — Vanilla has been cultivated in the Com Islands since 1875. At present it is the principal crop of the archipela in 1909 the crop amounted to 91 525 lbs. The greatest quantity is duced by the island of Anjouan (1 200 000 plants); the quantity harve in 1908 was 59 342 lbs., worth £32 031; the island of Mohéli gives the quality. Mayotte possesses about half a million plants.

Madagascar and neighbouring islands (1). — Vanilla is not native to island, but it is now widely spread, especially along the east coast. The ne bourhood of Tamatave seems to be too moist for *V. planifolia*, but m perhaps be suitable for other species. In 1891 there were already at round Vatomandry about 181 000 plants, and during the last tw years this crop has attained real importance in the island, espec in the provinces of Vohemar and Antananarivo, in the districts bet Andevoranto and Mananyari. In Madagascar it does not encounter serious natural obstacles, but the market is limited and the island is other competing centres of production, such as Réunion and the Com Islands, the plantations of which are in full bearing and producing a va which enjoys great repute. The exports began to be important in 1 in 1911 they reached 115 589 lbs., worth £87 452. The vanilla of Nos is especially renowned, but, like all Madagascar vanillas, is somewhat ing in perfume.

Réunion. — Vanilla has been grown in this island for about a cen

(1) See also No. 635, *B.* July 1914.

d it has also been exported for a long time, but it was only after 1862 t exportation became considerable. The so-called "vanillon" (the expor- n of which began in 1884) is not *V. pompona* but the pods of *V. plani-* less than 5 ½ inches in length. The cultivation of vanilla is somewhat easing in Réunion, but the island still occupies one of the foremost tions among the countries producing this commodity. Almost the le of the crop is exported. The graph of the exports from 1896 to 1 presents two maxima, in 1898 and in 1902, respectively 442 046 lbs., th £273 057, and 439 526 lbs., worth £107 196 ; in 1911 it was 146 610 , worth £73 606.

Bourbon. — Vanilla is grown almost everywhere up to 100 ft. above level ; it thrives better, however, in the windward part of the island n in the leeward. Bourbon vanilla ranks in the trade as a vanilla having rong perfume, while in Mexican vanilla the perfume is delicate and sweet.

New Caledonia. — It appears that vanilla was introduced about 1861 that only parts of the island are suitable to its cultivation. Experi- nts carried out on medium soils in the neighbourhood of Nouméa gave d results, but then the introduction of coffee raised more interest and illa was abandoned. In 1901 234 lbs., worth £127, were exported, but 1911 only 2 lbs.

Tahiti. — *V. aromatica* was introduced in 1848 and is now widely ead. It is grown chiefly by the natives ; the pods are picked too soon and ir preparation leaves a good deal to be desired ; the result is that the oduce is sold at a low price, chiefly to Germany and the United States. 1902, 318 525 lbs. were exported, representing a value of £47 493 ; in 03, 289 761 lbs,, worth £23 461. After 1904 the exports from Tahiti included in those from Oceania, which comprises Tahiti and Moorea. 1911 it amounted to 467 567 lbs., worth £95 944.

French establishments in India. — At Pondicherry vanilla was introduced o the botanic gardens of the colony about 1879. The production began be regular after 1888 ; it reached a maximum in 1901, with 280 lbs., th £175. The soil and climate of the French establishments in India not suitable to this crop, and the prices realized are not sufficiently unerative.

Indo-China.— Vanilla was introduced about 1865 to the botanic gardens aigon, but it has not gained a footing in the country.

The exportation of vanilla from all the French colonies amounted 1911 to 948 988 lbs., worth £389 832. The French colonies produce ut two-thirds of the vanilla produced in the whole world. Its consump- in France between 1907 and 1912 was about 132 300 lbs. per annum.

- **Nicotine in the By-products of the Cultivation of Tobacco** (1). — CHUARD, E., and MELLET, R., in *Compte-rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 159, No. 2, pp. 208-209. Paris, July 13, 1914.

Through the investigations carried out by the writers, in 1911, into variation of the proportion of nicotine in the several organs of the

(1) See No. 1424, *B.* Oct. 1912.

tobacco plant during the course of development, it was ascertained th the offal of the crop as it is raised in Switzerland contains considerab quantities of the alkaloid. This waste consists of tips and axillary shoo before the leaves are gathered; stems, roots and shoots after the leav are gathered. This waste, when used green, in order to avoid the loss nicotine due to esiccation, is an important raw material for the preparatio of the titrated solutions used as insecticides.

Experiments were undertaken in 1913 with a view to ascertaining th possibility of increasing the yield of nicotine in these waste products b suitably modifying the methods of cultivation of the plants and the treatment after the leaves had been gathered, without damaging the qualit and the quantity of the chief product; the following methods were tried 1) allowing the axillary shoots to grow instead of removing them as the appeared; 2) at harvest time gathering only the largest leaves, leavi in the ground all the stems provided with the recently formed shoots 3) treating with nitrate of soda the plants thus partially deprived of the leaves.

From the analysis of the plants thus treated the writers draw the follo ing conclusions:

1. The plants not deprived of their shoots are on the whole h abundant producers of the alkaloid (1.305 gm. nicotine per untouch plant against 1.891 gm. in the others), and this independently of t serious harm done, by not removing the shoots, to the quantity a quality of the main crop.

2. The yield of nicotine of the plants left in the field after the harv with the small shoots recently formed in the axils of the large leave much superior (0.942 gm. nicotine per whole plant against 0.432 g to that of the plants completely stripped.

3. Treating with nitrate of soda does not regularly modify the lative content of the different organs of the plant, but increases the absol production of alkaloid per individual by favouring its growth (with trate 0.739 gm. nicotine per completely stripped plant and 1.288 gm. partially stripped one). Thus nitrate is not a direct producer of nico (A. Mayer).

The writers conclude that it would not be advantageous, even f the point of view of the production of nicotine, to allow the growth of axillary shoots which are formed before picking, instead of removing t as they appear, but that the returns from the utilizable by-products (acc ing to the method of cultivation adopted in Switzerland) may be consi ably increased by giving nitrate of soda to the plants that are left stan after the harvest, during which they are deprived only of their large lea

Experiments in Growing Medicinal Plants at Korneuburg in 1913 (1). — ommunication of the National Committee for the Encouragement of the Cultivation Medicinal Plants in Austria, No. 17). SENFT, E. in *Zeitschrift für das Landwirtaftliche Versuchswesen in Oesterreich*, Year XVII, Part 3-4, pp. 129-182. Vienna, arch-April 1914.

fter some general observations on the cultivation of medicinal plants stria and on their disposal, the writer enumerates the chief pests attacked them in 1913. Thus it is remarkable that white grubs ed almost all the poisonous and aromatic plants, such as *Atropa*, *yamus*, *Datura*, *Angelica*, *Valeriana*, *Anacyclus*, *Pyrethrum* and , and respected only *Conium* and *Levisticum*. He then gives detailed nation on the sowing, manuring (in some cases), development, harvest and yield of the following plants: marsh mallow (*Althaea alis*), hollyhock (*Althaea rosea*), pyrethrum (*Anacyclus officinarum Anacyclus pyrethrum*), annual and biennial angelica (*Angelica archelica*), *Anthemis nobilis*, wormwood (*Artemisia Absynthium*), estragon racunculus*), deadly nightshade (*Atropa Belladonna*), blessed thistle us benedictus*), Caucasian pyrethrum (*Chrysanthemum* [*Pyrethrum*] um), Dalmatian pyrethrum (*Chrysanthemum cinerariaefolium*), y-grass (*Cochlearia officinalis*), foxglove (*Digitalis purpurea*), yellow an (*Gentiana lutea*), *Grindelia robusta*, *Gypsophila paniculata*, *Hydrastis lensis*, henbane (*Hyoscyamus niger*), hyssop (*Hyssopus vulgaris*), mpane (*Inula Helenium*), German iris (*Iris germanica*), lavender andula Spica*), lovage (*Levisticum*), liquorice (*Liquiritia*), mallow va sylvestris*), balm (*Melissa officinalis*), mints (*Mentha canadensis*, *rispa*, *M. viridis*), peppermint (*M. Piperita*), marjoram (*Origanum re*), *Panax quinquefoliuum*, opium poppy (*Papaver somniferum*), ey (*Petroselinum sativum*), rhubarb (*Rheum*), rue (*Ruta graveolens*), (*Salvia officinalis*), sclary (*Salvia Sclarea*), soapwort (*Saponaria offis*), comfrey (*Symphytum officinale*), tansy (*Tanacetum vulgare*), e (*Thymus vulgaris*), valerian (*Valeriana officinalis*), mullein (*Verm phlomoides*).

The number of species planted in the botanical garden during the 1913 was 140. Among them there are some North American medilants which thrive well, especially *Spigelia marylandica*, *Asarum ca-e*, *Hamamelis virginiana*, *Grindelia robusta* and *Hydrastis canadensis*.

The Influence of Soil and Manures on the Yield, Chemical Composition, ze and Quality of Strawberries. — VERCIER, J., in *Journal de la Société Nanale d'Horticulture de France*, Vol. XV (4th Series), pp. 349-375. Paris, May 1914.

lant food removed by strawberries. — This was estimated not only fruit harvested during one season but also in the vegetative organs plant representing one year's growth; the following results were ed (Table I):

(1) See also No. 1155, *B.* Oct. 1913; No. 1345, *B.* Dec. 1913; and pp. 26-30, *B.* Jan. 1914, by Dr. BÉLA PÁTER: Cultivation of Medicinal Plants in Hungary. (*Ed.*)

TABLE I. — *Removal of plant food from the soil by strawberries* (*lbs. per*

	Total crop		Nitrogen	Phospho-ric acid	Potash	Lime
	Green	Dry				
Removed by fruit, including calyxes and peduncles:						
in 10 English varieties . . .	13 400	4 800	45.32	41.46	43.40	
(composition per 100 parts green weight).			(0.338)	(0.310)	(0.324)	
in Alpine varieties	10 700	5 600	86.36	51.26	85.80	
(composition per 100 parts green weight)			(0.806)	(0.478)	(0.801)	
in 3 perpetual-fruiting varieties	13 800	7 200	90.00	46.78	93.55	
(composition per 100 parts green weight)			(0.650)	(0.338)	(0.676)	
Removed by vegetative organs:						
in 10 English varieties . . .	3 200	1 200	13.91	11.80	13.67	
(composition per 100 parts dry weight)			(1.17)	(1.00)	(1.15)	
in Alpine varieties	1 200	500	9.28	5.46	4.81	
(composition per 100 parts dry weight)			(1.83)	(1.08)	(0.95)	
in 3 perpetual-fruiting varieties)	2 400	1 060	13.90	0.90	7.54	
(composition per 100 parts dry weight)			(1.30)	(0.85)	(0.71)	
Total removed by crop:						
in English varieties			59.23	53.26	57.07	
» Alpine »			95.64	56.72	90.61	
» perp. fruiting »			103.90	47.68	101.09	

The figures for phosphoric acid are relatively high, as the soils experimental fields were rich in this element.

The effect of manures. — The effect of different manures on t of the fruit was investigated on various soils ; the results are g Table II.

TABLE II. — *Average weight of strawberries (Sharples) in grams.*

Soil	Control	Complete manuring	No potash	No nitrogen	No phosphoric acid	Slag alone	Potash alone	Organic manures
. . . . .	10.5	10.7	—	10.5	—	—	—	—
. . . . .	10.4	—	—	—	—	10.6	—	—
. . . . .	6.4	9.2	—	—	—	—	7.5	—
. . . . .	9.5	9.6	11.8	9.4	10.1	—	—	12.5
. . . . .	—	—	—	—	—	—	9.4	9.7
. . . . .	8.3	8.6	—	—	—	8.3	8.9	9.3

The influence of manures on the period of ripening was also examined, though manured plots in general may be said to ripen earlier than anured plots, the various manures produced very irregular effects iis connection.

The influence of manures on the flavour of the fruit is given in Table III:

TABLE III. — *Influence of manuring on flavour of strawberries.*

Manurial treatment	Points	Remarks
Unmanured	80	Typical flavour.
No nitrogen, but slag and sulphate of potash	60	Flavour reduced, not so sweet.
Complete manuring, slag, sulphate of potash and nitrate	63	Flavour reduced, very slight acidity.
No potash, but slag and nitrate . . .	93.5	Very fine flavour, large fruits.
No phosphoric acid, but sulphate of potash and nitrate	75.5	Fairly sweet and with a pleasant taste.
rganic manure: compost, blood and ake residues	79	Fruit well filled and with a pleasant taste.

Though the absence of potash raises the quality of the fruit, it also eases the total amount of the crop.

The influence of manures on the chemical composition of the fruit ven in Table IV.

TABLE IV. — *Influence of manuring on chemical composition of strawberries*

Soil	Manurial treatment	Yield of juice, per cent.	Sugar, in gms. per litre	Acidity, in gms. of H_2SO_4 per litre
A	Unmanured	54	63	6
	Dung	57	65	5.2
	Complete fertilizers and dung	56	73	5.9
	Slag and sulphate of potash	59	65	5.6
B	Unmanured	77	56	4.7
	Slag	68	67	5.0
C	Unmanured	54	63	6.0
	Potash	58	68	6.2
	Complete fertilizers and dung	56	56	5.5
D	Dung	86	86	6.4
	Slag and sulphate of potash	85.5	81	6.4
	Complete fertilizers	79.7	83	6.3
	Slag and nitrate	75.1	80	6.3
	Sulphate of potash and nitrate	81.3	80	6.3
	Compost, blood and cake residues	80.2	78	6.2

Influence of the soil on the fruit. — The following points for flav were awarded by expert tasters to samples of fruit grown on differ soils ; the two trials were carried out separately (see Table V).

TABLE V.

Variety	Soil	Points	Remarks
1*st trial*: Sharples	containing a fair amount of organic matter	80	typical.
	light sandy loam	109	best flavoured.
	low-lying sand	53	rather watery.
2*nd trial*: Vicomtesse Héricart de Thury	rich wheat land in good condition	30	slightly acid.
	very light, non calcareous	39	full flavoured, firm dense.
	poor gravel	38	full flavoured.
	marly	26	flavour less good.
	gravelly sand with 9 per cent. carbonate and iron salts	39	full flavoured.

Analyses of the fruit from different soils are given in Table VI.

TABLE VI.

Soil	Yield of juice per cent.	Gms. of sugar per litre	Acidity in gms. of H_2SO_4 per litre
tly sandy	57	65	5.2
lying sand	77	56	4.7
y hillside, unmanured for 5 years . .	54	63	6.0
en	86	86	6.4

In another set of experiments the changes taking place during the uration of the fruit were investigated and it was found that the acidity ually diminished, while the amount of reducing sugars increased.

The chemical composition of 16 varieties is given and various schemes nanuring are discussed in the paper.

- **Fruit and Vine Growing in Central Asia.** — BARSACQ, JOS., in "*Zapiski*" *Simferopólskavs Otdiéla I. R. obschtchestva Sadovodatva*, No 142, 1914.

I. *Fruit growing.* — In Russian Turkestan there are 29 123 dessiatines 632 acres) under fruit, mostly in the form of small native orchards, ugh of late years there has been a distinct tendency towards the estab- ument of larger orchards, up to 250 acres or more in extent, by the ssian colonists.

Of all fruits, *apricots* are the most common and are not only consumed ally in enormous quantities but also exported to Siberia ; a succession varieties assures a constant supply from May to August. The next ost common fruit is the *peach* ; a flat-fruited variety known as Cheftalé injir " is very popular, while the local varieties of nectarines are tter than the European varieties. *Mulberries* are an important crop not ly for the sake of their fruit but also as food for silkworms ; the large lited seedless varieties are eaten raw, or made into a kind of sirup which used as a sugar substitute, or even dried and made into a kind of flour hich is used as a substitute for bread in very out-of-the-way districts. *almut* trees are common in the forests of Ferghana, which, according to most recent statistics, extend over 35 000 dessiatines (94 500 acres); nuts are represented chiefly by a large fruited and by an early dwarf iety. Local varieties of *apples* and *pears* are few and worthless, but opean varieties, more particularly those cultivated in Crimea, have n introduced by Russian colonists and excellent results have been ob- ned in the Vierny district with Aport or Grand Alexandre ; in the neigh- rhood of the large Turkestan cities, especially Tashkent where fruit owing is develop'ng w'th rap'd str'des, satisfactory varieties have yet to selected, for shallow rooted stocks such as paradise or quince yield poor

specimens of trees and probably suffer from the great summer heat (up t 122° F.) and the drought.

As regards management, in order to keep down weeds, which are a serious pest, lucerne is sown in the orchards with excellent results; pruning is only practised in a very primitive fashion ; the orchards are irrigated four or five times during the course of the summer. Flowering takes place about one month before it does in the Crimea, and late spring frosts are liable to cause very extensive damage, especially to the hard fruits.

With regard to diseases, codling moth (*Carpocapsa pomonella*) is by far the most destructive and affects up to 80 and 100 per cent. of the apples this insect, though native, has few natural enemies and an attempt was made to introduce *Oophthora semblidis* and other of its internal parasites but without success. As the moth has three broods in a season, the late varieties of apples suffer most and 75 per cent. of their fruits are attacked as against 20 per cent. of the early varieties. Preventive and remedial measures employed successfully in other parts of the world, such as spraying trapping, grease-banding, seem useless in Turkestan, but certain large growers have adopted the method of bagging their fruit and the practice seems to be spreading. *Tingis piri*, apple sucker (*Psylla*) and its allies, *Phyllaphylla adspersa* var. *pulverea*, *Melolontha afflicata*, *Rhizotrogus solstitialis*, *Tropinota turanica*, *Oxythyrea cinctella*, *Cetonia margicollis* also cause serious damage. Owing to the almost complete rainlessness of the summer fungoid pests are rare. Certain choice varieties of apples are frequently affected by so-called "Stippigkeit", which is thought to be of physiological origin though its cause is at present unknown ; the disease is characterised by corky filaments under the epidermis which appear usually after picking and it is spreading in a somewhat alarming manner.

Turkestan apples are inferior in quality to Crimean apples and the writer does not consider that the country will ever be capable of producing any but lower grade fruit ; this produce will find an outlet in Siberia, which is being connected up direct with Turkestan by a railway. Early varieties of fruit will also be marketable in Russia, as they ripen about a month earlier than the crop in the European temperate regions.

II. *Vine growing*. — It is estimated that 25 000 dessiatines (67 acres) are at present under vines, of which 13 000 dessiatines (35 100 acres) are in the Samarkand district. Small vineyards are the rule. The writer gives a detailed account of cultural methods practised by the natives, including irrigation, which consists of five or six waterings during the summer.

As the Mahommedan law prohibits the use of wine, the varieties usually cultivated, amounting to about 40, are all table fruit with thin skins, few or no pips, and firm pulp ; they grow in long loose bunches. About three quarters of the vineyards are planted with Kichmich, which is dried to produce currants. Masca is a very large kind with bunches averaging 3 lbs. in weight and sometimes reaching 10 lbs., while each grape may have a diameter of 1 ½ in. ; the fresh fruit is in good demand not only locally but also in Moscow and Petrograd. Khoussaïné is a coarse variety in the neighbourhood of large cities and is exported to the n

the name of Ladies'-fingers; it keeps well and is a heavy cropper, cing 1 000 to 3 000 poods per dessiatine (13 000 to 40 000 lbs. per Early varieties such as Ak-tchiliaku, which ripens at Tashkent the middle of June, have also been cultivated of late years.
:ussian colonists have tried certain European wine-making varieties, ough the vines appear to have become thoroughly acclimatised and good crops, the wine is of poor quality.
he exportation of fresh grapes to Russia is capable of great develop- and is receiving encouragement from the Government in the shape of ply of cold-storage trucks and an accelerated railway service; exports increased steadily since the opening of the Tashkent railway.
he dried raisin industry, too, is worthy of encouragement, for the tic conditions are eminently suitable for the drying process and the ce could be vastly improved by the introduction of more up-to-date ds. About 1 250 000 poods (45 million lbs.) of dried raisins and cur- are sent annually from Turkestan to Russia and another two million consumed by the latter country, are furnished by Persia and Greece they might easily be produced in Turkestan.
ine making, on the other hand, suffers on account of the great sum- eat and excessive sweetness of the grapes and has made little pro- white wines are coarse and have a bitter after taste, especially when with local table varieties; the writer is of opinion that ordinary table will never be greatly improved unless the processes of vinification nsiderably modified, but there are great possibilities as regards the tion of sweet wines with a high alcohol content. The manufacture ndy has been attempted by a few firms, but without much success, as coarse high coloured spirit has been obtained.
Phylloxera is unknown in Turkestan, while fungoid pests are rare, limited to oïdium and *Cercospora*. The most serious enemies are birds which destroy large quantities of grapes in some places; dogs considerable damage, as they are rarely fed by their native owners apes represent a welcome addition to their diet.

LIVE STOCK AND BREEDING.

Experiments on the Control of Warble Flies in Germany (1). — SCHÖTTLER GLÄSER, in *Mitteilungen des Ausschusses zur Bekämpfung der Dasselplage*, No. 6, Berlin, 1914.

In 1913 the Warble Control Committee undertook the treatment of ttle in the district of Neuhaus on the Oste; out of a total of 3892 head, or 75.4 per cent., were freed from warbles; the number of larvae ed was 47 625, that is an average of 16.2 warbles per head. The work ne in the second half of April shortly before the cattle were turned raze; the average time for dealing with each animal was a quarter

(1) also No. 534, *B* June 1914. (*Ed.*)

of an hour. The larvae were either squeezed out by hand or extra
by means of tweezers. Most of the cattle kept fairly quiet during
operation, and in only 21 cases did a slight nettlerash follow. The t
cost amounted to 423.70 M. (£20 15 s 5 *d*), or 0.89 Pfg. (0.11 *d*) per larva
for each of the 3892 head of cattle existing in the district a little over
This is about the price paid formerly in Oldenburg for removing war
The cost, however, varied from one locality to another and with the
of cattle. Heifers and steers were the most affected with warbles,
cows had not so many, though they were certainly not free from th
bulls had the lowest percentage of warbles. Considering the depreci
of each hide due to warbles to be 3.89M.(3 s 9 $^{3}/_{4}$ *d*), the loss of the farm
in the district under consideration was about £ 560. If the reductio
the amount of flesh laid on and the check in the growth of the young ca
be also taken into account, the loss would probably be twice as much.

In a second part of their paper the writers report upon last ye
campaign against warble flies in the district of the Wesermarsch Herdb
Association in the Grand-duchy of Oldenburg, where for several yea
has been compulsory to free cattle from warbles. In order to giv
idea of the success of the control of warbles the Chamber of Agricul
by means of the communal authorities, distributed among the owne
cattle upwards of 13 700 question-sheets; 3000 replies containing s
cient data were arranged statistically. The extraction of warbles in O
burg was carried out in most of the cases by the owners themselves and
exceptionally by professionals, who in general were more successful
the former. The number of cattle to which the replies referred was 5
that is 40.60 per cent. of the whole stock of cattle in the district; of t
27 870 head or 64.43 per cent. bore warbles. The percentages
cows 66.35, heifers 87.69, steers and bulls 85.81, and calves 8.58. I
herds examined there were 312 495 warbles, which would give
770 000 for all the cattle of the district, or 7 or 8 per head of the whol
11 or 12 per animal infected. The lowest number was found on the
which had barely one each, while the cows had 4 or 5 and the ste
or 13. The total number of larvae killed was 204 184; the greates
dom from warbles was obtained where the operation was repeated in
On the "Geest" (high-lying land) pastures the cattle suffered mor
warbles than on the marsh pastures on account of the greater dry
the former. The same had been observed also at Neuhaus on the

Lastly the writers report an experiment made by them to demon
that the warble larvae caused the cattle to lay on less flesh. Ten
were kept under exactly the same conditions, five being freed from
and the others not. The result was that the former gained an a
of 37.4 lbs. per head more than the others. Thus it appears that t
in flesh caused by warbles is still greater than the loss caused by
to the hides.

- Effect of Long Storage of Meadow and Clover Hay on its Composition and Digestibility. — HONCAMP, MÜLLNER and STAU, in *Die landwirtschaftlichen Versuchsstationen*, Vol. 84, Part 5-6, pp. 447-481. Berlin, June 16, 1914.

I. *Meadow hay.* — The hay used in this experiment had been ed for six weeks in a hay loft; it was then chaffed, uniformly mixed wrapped in paper to prevent losses of any portion of it. After this as kept for three years in a large airy room not heated in the winter. samples were analysed: 1) at the beginning of the experiment; after a year and three-quarters; 3) after three years. The results of three analyses did not differ to any extent from each other.

In the digestibility trials, the hay was fed to two sheep at the rate of 4 lbs. per head per day at five different periods. The average coefficients of digestibility obtained are shown in Table I (averages of the two ep).

TABLE I.

Period	Dry matter %	Organic matter %	Crude protein %	N-free extract %	Crude fat %	Crude fibre %
gust 1909	58.9	60.8	68.0	59.6	48.2	59.8
ay-June 1910 . . .	60.4	62.5	68.3	62.6	48.1	61.6
ay 1911	59.6	61.3	69.6	60.5	46.0	59.7
bruary 1912 . . .	58.0	59.8	67.4	58.1	51.5	59.5
ug.-Sept. 1912 . .	59.8	61.5	68.8	60.5	51.1	61 –
se of digestibility in period as compared h rst.	0.9	0.7	0.8	0.9	2.9	1.2

The digestibility of meadow hay has thus remained very constant ng the three years and has in nowise suffered from the long storage; variations of digestibility observed fall within the limits of experital error. The writers conclude that by proper storage with suitable ilation meadow hay does not suffer any loss either in its nutritive ents or in its digestibility, and that the different results obtained by r observers are due to losses caused by mechanical action, such as the pping of the leaves rich in nitrogen and consequent proportional inse of the more fibrous stalks, or by lack of proper precautions in pling.

II. *Clover hay.* — The clover hay used consisted of 60 per cent. clover 40 per cent. ryegrass; it was chaffed and well mixed, part being wrapped paper and part placed in a dry loft. It was kept for two years, and ng this time did not show any change in its content of nutritive matter. the experiments on its digestibility it was fed to two sheep in six differ- periods. The average coefficients of digestibility for the two sheep given in Table II.

TABLE II.

Period	Organic matter %	Crude protein %	N-free extract %	Crude fat (Ether extract) %	Crude fibre %
I. July-Aug. 1911	62.9	65.0	66.0	58.9	56.5
II. Dec.-Jan. 1911-12	61.9	60.8	67.2	55.3	54.0
III. Sept. 1912	62.7	62.4	67.4	56.0	55.5
IV. Sept.-Oct. 1912	60.2	60.2	65.3	53.4	51.4
V. Sept. 1913	61.8	60.7	66.9	61.4	54.0
VI. Sept.-Oct. 1913	60.0	60.7	63.9	56.4	53.1
Decrease of digestibility in the 6th period as compared with the first	— 2.9	— 4.3	— 2.1	— 2.5	— 2.8

During the periods 1, 2, 3 and 5 the hay fed was taken from the pa wrappers and during periods 4 and 6 from the loft.

The differences in the digestibility during the various periods so small as to lie within the limits of experimental error. The wri therefore conclude that clover hay does not suffer any loss either in nutritive contents or in its digestibility.

With both meadow hay and clover hay the valuation according botanical analysis agreed with that based on the digestible protein and the starch value; on the contrary valuation according to crude protein crude fibre content did not agree with valuation according to botan analysis.

The classification of fodder is therefore to be based exclusively on content in digestible protein and starch value.

832 – **The Value of Different Kinds of Straw as Fodder.** — HONCAMP, REIS MÜLLNER, in *Die landwirtschaftlichen Versuchsstationen*, Vol. 84, Part 5-6, pp. 301 Berlin, June 16, 1914.

This is a critical study on the present views, mostly based upon experiments of Henneberg, Wolf and others, on the food value of ferent kinds of straw. The investigations dealt with the straw of bar oats, wheat, rye, spelt, peas, lupins, rape and colza. Each kind of st was examined as to its content in organic matter (according to the us methods) and inorganic matter and crude fibre (according to Kö Weender, Cross and Bevan); it was then fed to two sheep in order to as tain its digestibility.

As the weather is said to influence the chemical composition of st and also to a certain extent its digestibility, the straw of the very dry y 1911 was compared with that of the wet year 1912, as far as possi In most cases the different straws were taken from the same farms.

straw was mixed with hay and 0.66 lb. of it was given to each sheep
m. The straw of Cruciferous and of Leguminous crops was fed at
te of 1 lb. per day and mixed with beet-slices, soy-meal and hay.
he results are summarised by the writer as follows :

1. The general opinion that spring grain straw is poorer in crude
han the corresponding winter grain straw is in many cases erroneous.
2. The weather conditions have in general a relatively small influence
percentage of organic and inorganic matter in the different straws,
east this influence is not so marked as in fodders richer in protein.
3. König's crude fibre method gives mainly a pentosan free crude
which is not the case with Weender's method. To this is probably
n many cases, the lower yield of crude fibre by the former method.
's method for the determination of pure cellulose is not correct;
sent Cross and Bevan's method is more trustworthy.
4. The straws of spring and winter grain can be considered of equal
as to their digestibility. The straw of Cruciferae (rape and colza)
rior in value to cereal straw, while the straws of Cruciferae and of
minosae are about equal.
5. The value of a fodder is correctly expressed only by its starch
The classification of fodders according to protein and crude fibre
it leads in general to erroneous conclusions.

The Contribution of Bacteria to the Feces after Feeding Diets Free from Indigestible Components. — OSBORNE, T. B., and MENDEL, L. B. (Connecticut Agricultural Experiment Station) in *The Journal of Biological Chemistry*, Vol XVIII, No. 2, pp. 177-182. Baltimore, Md., July 1914.

he feces of 17 rats fed on various diets entirely free from indigestible
ments were investigated with a view to determining what proportion
excrement was made up of dead bacterial bodies. The special
consisted of protein, starch, protein-free milk (1), and lard, so that
possible to avoid the great difficulty always encountered in previous
iments of separating the bacterial cells from fragments of more
nt undigested food. The feces were dried and ground ; the powder
btained was then successively extracted with ether, alcohol (ab-
and 80 per cent), 0.2 per cent. hydrochloric acid, and absolute
l containing 0.2 per cent. hydrochloric acid. The final residue varied
2 to 41 per cent. of the dried feces and its nitrogen content calcu-
on an ash-free basis was fairly constant, amounting to from 10.7 to
r cent., which corresponds closely to numerous recorded analyses of
al cellular substance. Microscopical examination also suggested
e residue consisted of an almost uncontaminated mass of bacterial

ee No. 1171, *B.* Oct. 1913 ; No. 142, *B.* Feb. 1914. (*Ed.*).

834 - **The Breeds of Horses in Norway.** — *Communication from* CHR. WEIDE *sented by the Delegate of Norway.*

Under the action of the special conditions of Eastern Norway a sp breed of horses, known under the name of Gudbraundsdal (a valley Central Norway), has been developed. These horses are raised by s farmers.

As for its origin, it is most probably the most northern branc the western horse. Its appearance and anatomical structure rese greatly those of the Danish Jutland and of the old Hessian horses. agrees with the hypotheses as to the emigration of the human races the native breed of the Gudbrandsdal foreign blood was introduced d the 17th and 18th centuries and during the first half of the 19th ing the first two centuries it was especially Danish blood, chiefly to stallions from the old stud of Friedriksborg. Later, in the first of the 19th century, only a relatively small amount of foreign blood introduced and that of very different origins. The importation of a roughbred English stallion *Odin* is of special interest : its third genera included *Balder*, whose blood is at present diffused in all the Gudbran breed.

These horses are mostly bay or black ; about 4 per cent are ches and 1 per cent cream, while white is quite exceptional. Specially mar animals are relatively rare. The stature of the stallions taken as an a age of 90 four-year-old horses born between 1900 and 1904 was 15 h 1 inch. The mares are generally about 1 inch less.

The head is usually of average length, with a straight and broad head and well set ears. The neck is somewhat heavy for the size of horse, and the head not very well set on. The chest, of average depth a good breadth ; the average girth of the above-mentioned 90 stallions 74.02 inches. The withers are of a good shape. The back is inclin be too long, but there are many specimens with a very handsome The ribs are well arched ; the rump is somewhat sloping and of av length and breadth and on the same level as the withers. The tail on high. The thighs are well proportioned as to length and are mus Altogether the muscular system is well formed. The legs are of av length. The hocks are large, well shaped and clean forming a angle. Occasionally turned in hocks occur. The cannon bones average length and clean, the pasterns short or medium and duly sometimes upright in stallions. The shoulder has a good position. knee is well formed and strong ; flat and knock knees never occur. cannon bones of the fore limb are also clean ; measured in the narro part, they averaged, in the 90 horses examined, 8.37 inches. The pasterns are of average length and duly sloped ; occasionally low defective positions are met with. The hoofs are of average size an excellent quality; formerly they were often thin and flat owing to defe breeding, but now these defects have completely disappeared.

The action of these horses is regular, their trot long, but their

y elegant. It is a very suitable horse for the peasants, being ıd thrifty as to food.

y are usually fed on hay, oats and rye bran ; in some places forest re added but hay is always the principal food. Foals usually ıt 11 lbs. a day during the first winter and 13 to 20 the next three The daily ration of oats is from 2 to 3 ½ lbs. during the first in the succeeding winters very little oats are fed, 2 to 3 lbs. of ı being given instead.

oughout the whole summer the young animals are turned out ; and the brood mares are collected in droves of about 40, with llion, on the mountain pastures. These pastures belong to the r to private owners. The latter let them to associations or possess n of their own. In 1907 the national stallions gave 85 to 95 per fertile matings on the pastures and only 68 to 77 per cent. in the

; State assistance consists of grants to associations for the purchase ons. These grants amount in some cases to £ 100 or £ 150. The ıdeavours also to favour horse breeding by yearly shows, the most ıt of which is held at Lellehammer at the end of April or begin- May; often as many as a hundred or a hundred and twenty stallions ected here. The greater number are sold, fetching from £ 150 0. Most of them remain in Norway, but a good number go to and Russia and of late years some have been sent to Austria. the Lillehammer show there are smaller national shows which erally held in the autumn and in which mares are more in evidence. ares which have had prizes or have been approved, obtain for five he right to pasture free with the national stallions. The price of a t horse varies between £ 35 and £ 44.

ıe Studbook is kept by the State. The first volume appeared in the fifth this year. Only the stallions that have been awarded at the shows are entered. Exception may be made for a stallion ; good stock. Mares must be pure bred and must have already borne o a Gubrandsdal stallion. Some conditions concerning their out- ıformation have also been added.

mong the measures for encouraging horse breeding due to private ive, the numerous trotting societies which organize matches during nter must be noticed. Most of them are united in a large associa- Det norske Traverselskab " (The Norwegian Trotting Association). ıst races only pure bred Norwegian horses are allowed to compete. he native breed of Western Norway is called the Fjord breed. Its is not completely known ; possibly it is a branch of the Celtic pony. fjord is a wiry horse, standing 14 to 15 hands 1 in. high. Its coat ost always whitish, but of different shades ; from time to time also re met with. The head is small with a broad and straight forehead mall and very mobile ears. The neck is strong and the head well set The chest is deep and of average breadth. The withers are round, ack of average length, and the ribs well arched. The rump is slop-

ing and often not quite muscular enough. The tail is high set and h
The thighs are muscular and of satisfactory length; the hocks are also
clean but their breadth is not always sufficient; they are often much turn
in and the angle they form is not always ample enough. The cann
bones are of average length, and clean; the pasterns are short and set
a true angle. The shoulder is somewhat short and vertical; the a
and forearm are of medium length, the latter being often poor in mus
The knee is well formed; the fore cannon bones are clean and well mach
the fore pasterns are short and generally well formed, though sometim
owing to defective breeding knock-kneed animals are met with.
hoofs are small and of excellent quality. The step both walking
trotting is rather short, but the rapid action allows a great speed to be
tained. These horses are very hardy and exceptionally enduring,
frequently travel 50 to 70 miles in a day.

835 – **Formation of a German Sheep-breeders' Union.** — *Zeitschrift für Schaf*
Part 7, pp. 145-150. Hanover, July 1914.

On the occasion of the German Agricultural Society's Show at
nover this year a Union of German sheep-breeders was founded (Deuts
Schäfereiverband) with the object of uniting all the existing associat
of sheep-breeders and individual breeders in an association for furthe
sheep breeding in Germany.

836 – **The Angora Goat.** — HELLER, L. L., in *U. S. Department of Agriculture*
mer's Bulletin, No. 573, pp. 1-16. Washington, April 27, 1914.

The value of the 1909 clip of mohair in the United States was $901
that is nearly four times as much as in 1899. The number of fleec
mohair rose from 454 932 in 1899 to 1 682 912 in 1909. Of this
number 1077 463 came from Texas, 155 980 from New Mexico and 14
from Oregon; Arizona and California each contributed upwards of 10
and Missouri was the only other State with over 20 000. The av
weight per fleece was 3.7 lbs. in Oregon and 1.85 lb. in Texas. In the
State many Angora goats are shorn twice a year, for which reason the
of mohair per head is undoubtedly above the census figure for the av
weight per fleece in the State. Assuming that one third of the
Angoras are shorn twice it would appear that in the United States the
number of Angoras of shearing age was about one million.

During the last few years the breeding of these goats has increa
importance more than that of any other animal and it is now carried
almost every one of the States. Conditions are especially favoura
this branch of animal husbandry in the North-West, in which br
so abundant, and where the Angora goat contributes greatly to the c
of forest fires by clearing brush lands. American Angoras have b
been exported mostly from California to South Africa, Canada,
and recently also to Brazil and the Argentine Republic. The first A
introduced into the Union were mostly crossed with common go
order to obtain a larger and hardier animal. The first and second
showed but little mohair and much kemp, and five or six crosses wit

as were necessary before a really superior animal was obtained. he fifth cross the product could be considered as pure bred Angoras. riter does not consider it advisable to cross with common goats in to obtain Angora flocks. He considers it better to import good il animals and to keep them pure from other strains.

he Angora goats of the United States are generally pure white and l. Their ears are either partially erect or drooping. Their bodies a good constitution; they are symmetrically built, and with the ion of the inside of the upper part of the legs they are well coated leece. The demand is for fine quality, closely curled, very glossy and as nearly as possible free from kemp.

he price of mohair has of late years much increased in the Union to the many usages to which it is put (manufacture of plush, over- wigs, etc.). The weight of fleece for American Angoras ranges en 2 and 12 lbs. The fleece of a one-year-old goat weighs 2 ½ lbs. e the fleece is allowed to grow for 12 months the average length of is about 10 inches. The total weight of the fleeces produced in nited States in 1913 amounted to nearly 5000 000 lbs. The best of nes from the North-Western States. The average cash production oat is, according to the North-West Angora Goat Association, $ 1.75 ith many as much as $ 2.25 per annum. Besides this considerable production, the United States import, in round numbers, about 000 lbs. of mohair, which is on the average superior in quality to merican produce.

The loss of weight in washing of the home hair is about 12 to 15 per , rather greater than that of the imported article. The skins of Angora the hair attached are sometimes tanned in the United States and are used for rugs, carriage robes, etc. The flesh finds a ready market, ially in Kansas City. The average weight of the goats slaughtered is about 68 lbs.

Shearing takes place from February to March and the second clip eptember or October in the South-West, and from March to April e rest of the country.

The most important Angora breeding associations are the "American Breeders' Association", the "National Mohair Growers' Asso- ion" and the "North-West Angora Goat Association".

- **hicken Rearing.** (1) — *The Journal of the Board of Agriculture*, Vol. XX, No. 12, pp. 1049-1057. London, March 1914.

The demonstration by Mr. F. G. Paynter of his system of producing poultry, which was commenced in December 1912 at Haslington near Crewe, under the auspices of the Board of Agriculture and Fish- in conjuction with the Cheshire County Council, came to an end in mber last. An area of 4 acres in the middle of a newly formed small ngs colony was devoted to the demonstration, and from that point ew was particularly suitable for the purpose.

(1) See also No. 160, *B.* Feb. 1913. (*Ed.*).

During the whole time the demonstration lasted it was thrown open to the public. The Cheshire County Council appointed a temporary demonstrator whose chief duty it was to show people round and explain the system to them; the result of these and of other means to attract those for whose benefit the demonstration was designed, was that a large number of people visited Haslington Hall while the work was in progress.

Incubation was commenced in the beginning of December 1912 and terminated by the middle of the following July. Three incubators holding 340 eggs, and one holding 390 eggs were used. All the eggs were bought from various sources. The result of the incubation was as follows:

Number of eggs bought	9 897
» » broken	294
» » infertile	1 690
» » not hatched	3 885
» of chicks obtained	4 028
Percentage hatched on total number of eggs incubated	41
» of chickens hatched after allowing for broken and infertile eggs	51
Average cost of eggs per chicken hatched	4½d

The proportion of chickens hatched to eggs purchased was never more than 54 per cent. This relatively small proportion was partly due to shaking in transit and it is probable that better results would have been obtained if reliable eggs could have been purchased locally.

From the incubators the chickens were removed to the brooders and when they were seven weeks old they were removed to larger wire runs (100 × 10 yards) and housed in so-called "Sussex arks," where they stayed until about 16 weeks old, when they were ready for sale. The plan adopted by Mr. Paynter for disposing of them was to contract beforehand for the sale of the whole of his output to a poulterer near London, at fixed prices varying from 3*s* 9*d* in April to 2*s* 6*d* in September.

The number, values and weights of the chickens sold were as follows:

Number of birds sold	3 471
Weight	13 968 lbs.
Average weight of chickens when sold	4.024 lbs.
Value of birds sold	£496 8*s* 1*d*
Average price per pound	8½*d*

The following is a summary of the food consumed and of its cost:

		£	*s*	*d*
3 437 lb.	Chick feed	24	10	1
7 071 »	Biscuit meal	40	5	8
711 »	Oatmeal	5	3	1
389 »	Rice	3	2	3
1 899 »	Bran	6	18	9
2 862 »	Meat and fish meal	24	9	3
4 475 »	Barley meal	19	18	4
21 210 »	Sharps	77	6	7
18 985 »	Wheat with 10 per cent. of maize	68	3	5
		£ 269	17	5
Grit		5	10	0
	Total food bill	£ 275	7	5

he profit and loss account shows a net profit of £55 1s 2d. This is vely small, but it must be borne in mind that the work was seriously ered with by the reception of so large a number of visitors, and that utlay was valued somewhat high. In practice a small holder would on several items, such as part of the work, and his profits would be r.

During the current year Mr. Paynter is conducting a similar demonstra- in Cambridgeshire.

Experiments on Egg Laying in Different Breeds of Poultry. — (Eighty-urth Report of the Royal Veter nary and Agricultural College Laboratory for Agric- tural Experiments at Copenhagen). *Communicated to the International Institute of riculture by the Correspondent for Denmark.*

The object of these experiments was: 1) to determine the difference e yield of eggs of various breeds of poultry; 2) to throw light on several itions of fertility of the eggs and on the colour of the shells.

1. Experiments were carried on for three years on the egg laying of following breeds: White Leghorn, Brown Leghorn, Barred Plymouth k, White Wyandotte, Black Minorca and Houdan. The Leghorns first place for both number and total weight of the eggs. While the age number of eggs laid by the Leghorns during the three years was t 100, the Plymouth Rocks laid about 70, the White Wyandottes 60, the Black Minorcas about 90 and the Houdans about 80. The for the last three breeds, however, are only approximative as in l of the pens disease was rife.

comparative trials of Brown Leghorns, Nassaus and Orpingtons, tter gave the highest yields, followed by the Leghorns, the Nassaus g last. Considering only one-year-old hens the Nassaus and especi- he Orpingtons laid more eggs than the Leghorns, but if the two to year-old hens be included in the amount the result is somewhat favourable to the Leghorns. The good result with Orpingtons is attributed not only to relatively better laying, but especially to a uniform distribution over the individual months in the year.

2. As to the most profitable age for egg laying it has not been ble to determine any sure rule. Most hens lay the greatest number gs during the first or second year, but there were some that produced in the third year. In general it may be considered that the greatest ber of eggs is obtained during the first year.

3. As for summer and winter laying there is no large difference ween Plymouth Rocks and Leghorns, the former laying a slightly er percentage of their eggs during the winter months than the latter. s also been observed that the older hens lay a smaller percentage of eggs during the winter months than the younger ones.

4. The weight of individual eggs was greater for Minorcas and rns than for White Wyandottes and Houdans. It seems as if the t of the eggs increased with the age of the hen.

5. Repeated weighing has shown that the weight of the birds in- s with age, but only up to the end of the second year, when they are

fully grown. Within each year the weight of the body seems to fol certain laws, according to which it grows from autumn to spring and sh again during spring and summer. This is especially noticeable in g layers, the body weight of which decreases to a greater extent than t of the bad layers during the spring months when egg laying is more acti

6. From the observations made, it appears that broodiness, wh is more frequent among Plymouth Rocks than among Leghorns, is n pronounced in the best layers.

7. The above experiments have further shown that 16 days a mating the hens still lay fertile eggs. When mating is repeated aft period of more than 16 days, the first fertile egg is generally laid three d and sometimes four days later.

It has not been possible to influence the colour of the egg shel pairing a cock of a breed which has yellow or brown eggs with a he another breed that lays white eggs, or viceversa. The breed of the is alone responsible for the colour of the egg shell.

The number of eggs laid, as given in paragraph 1, will be tho somewhat low and there are doubtless many flocks of poultry in Den that lay more eggs. One of the reasons of the relatively low numb eggs obtained during these experiments is that for the sake of other t the poor layers, which a private breeder would soon get rid of, had to be kept. Thus, for instance while one Plymouth Rock laid in the years 200, 177 and 182 eggs, another one laid during the same time on 2,5 and 4 eggs respectively.

839 – **Contribution to the Study of Sericulture in Indo-China.** — Bui-Quan Chiêu, in *Bulletin économique de l'Indo-Chine*, Year 16, Nos. 101 and 102, pp. 1 178 and 376-401. Hanoi-Haiphong, March, April, May, June 1913.

Silkworm breeding was introduced into Annam from China about t tenth century. It was encouraged by the Annamese emperors, especia Gia-Long and Minh-Mang, and soon became a flourishing industry in t peninsula, continuing in this condition up to 1851, after which date progress ceased. The French administration, notwithstanding ma efforts, has not yet succeeded in giving sericulture in Indo-China development which the good natural conditions of the country wo allow; on the contrary the industry has even declined. This stat things is due to deep-seated economic and social causes:

1. The intense literary culture, which induces the educated Annam ese to take up administrative careers (as mandarins) and to neglect ag culture and industry.

2. The improvements in the European cotton industry, which pr vides Indo-China with cheap and good cotton goods that have in ma cases taken the place of the old silk tissues.

3. The natives were formerly taxed, by the mandarin administ tion, arbitrarily and according to their apparent wealth; consequen they did not dare to use the fine Chinese silks which would have mark them out to the rapacity of the mandarins. Under the French admin tration they have abandoned the Indo-Chinese silks in favour of the Chin

s and of late years they have made much use of Lyons and Japanese notwithstanding their higher prices.

4. The neglect of the cultivation of mulberries for that of rice, the being easier to sell than cocoons; besides which there is no doubt the diseases to which silkworms are liable have discouraged many e breeders.

At the time of the French conquest, according to Dr. TURC, great es of production existed in the huyen of Kien-duong (now Cai-fây, é and Rach-gâm) in the province of Dinh-tuong (Mytho); the districts dee and Bentré, which sent their produce to the great market of Vinh-; in the east of Cochin-China the districts of Baria, Long-thanh and Thu-môt; at present next to nothing remains of the great plantations. In French spinning mills were started at Cholon, but they had to be aban-d on account of the fall in prices on the Lyons market. In 1883 the ernment nominated a mission for the reorganization of sericulture and ded a silkworm breeding establishment at Cholon, in which an attempt made to improve the native worms by crossing with foreign breeds. The lts were bad, and the same was the case with all attempts at crossing Chinese or Japanese worms. M. VIEIL believes that these failures lue to the fact that the native worms, being more slender, can eliminate r vapour better than the French, Chinese, or Japanese worms, which fatter and consequently present a smaller evaporating skin surface in parison to their weight; he does not think that there has been, as often been asserted, any degeneration of the Indo-Chinese worms. He eves also that breeders have launched thoughtlessly into the system of sing, which, if it had been preceded by study and systematic experi-lts on the best breeds more akin to the native breeds, might have yielded better results.

In 1905 a silk specialist was entrusted by the Governor-General with ission which resulted in the formation of a French company; this red into an agreement with Indo-China for the selection and free dis-ution of silkworm eggs to the natives by means of subscription. The spinning mills of Nam-dinh were resumed and the breeding farm of -lang-thuong, which was managed by M. VIEIL, was attached to it. latter came to the conclusion, from the experiments he made, that it better to keep to the improvement of the Annamese breeds and to teach natives how to rear the worms. At the same time reeling basins European pattern were simplified for the natives. These basins, the e of which is not above 12 shillings, were given free of charge to the amese; a Lyonnese employee of the Agricultural Service, a silk specialist, instructed to teach them the way of using them.

All these efforts are beginning to bear fruit and already the quality he silk exported to the mother country is improving. Indo-China has followed the rapid progress of Japan; even Corea and Siam have develo-their sericulture. Indo-China, which has a population well adapted to kind of industry and which might make use of the scientific results

acquired by the mother country, will also see a great increase in i silk production.

Geographical distribution of sericulture in Indo-China.

The whole of Indo-China raises silk, but the delta districts take th lead.

Tonking. — The provinces in which silkworms are reared on a lar scale are the following, arranged according to their importance: Nam-dinh Thai-binh, Bac-ninh, Phu-lien, Phu-lang-thuong, Phu-ly, Hung-yen, Hano and Son-tay. Mulberries are grown in the alluvial lands, on th banks of rivers (Red river, Song-thai-binh, Song-thuong, etc.). Reelin and weaving are practised especially at Nam-dinh and Thai-binh. Ther are at Phu-lien flourishing plantations and important native weaving fac tories (Do-son, Kien-an).

Annam. — Sericulture is practised in all the provinces, but in the sout (Khánh-hoá, Phú-yên) and in the north (Thánh-hoa, Quang-binh) it ha rather declined; it has markedly progressed in the centre in Binh-dinh and Quang-nam. At Phu-phong, in the province of Binh-dinh, ther is a great industrial spinning and weaving centre. Silk raising has declined in the province of Thua-thien, the only centres being the huyen of Phu vang and the district of Thien-mô, which are not very important.

Cochin-China. — The silk industry is more widely spread but in a mor backward state than in Tonking. There are no European factories and th attempt made twenty years ago by commander COLBERT DE TURGIS a Tan-chau to establish a station for killing the pupae in the cocoons failed. There are, however, about 3700 acres of mulberry plantations and all th silk industry is in the hands of small native growers and is at the same level as it was two thousand years ago. There are also some important centres of mulberry growing and silkworm rearing in the province of Chaudôc, especially in the mountainous district about Thai-son, Tu-tê, and Tinton, where the inhabitants are chiefly Cambodians. The island of Ci-lao ba and the Malay canton of Châu-giang form an important spinning and weaving centre. In the province of Long-xuyên, the mulberry belt extends from Cu-lao-giêng to the Ongchuong canal, including the village of Longdiên and others, as well as some islands round Cu-lao-giêng. The village of Cho-tu-chên-sai is the most important centre of this district (and perhaps of the whole of Cochin-China), exporting its silks (generally dyed black) especially into the provinces of Cân-tho, Rach-giá and Bac-lieu. The province of Sadec, formerly renowned for its worked silks called "hang không-tren," has to day only La-vung as centre, and this is of no great importance. The course of the Mékong has then to be followed as far as Bentré (Batri and Mocay) before the mulberry is again met with. A kind of taffeta called "lua", which formerly had a certain reputation, is woven there. In the provinces of Bac-lieu, Soc-trang and Tra-vinh all the silk industry is in the hands of Cambodians; the Cambodian centres of Thakha, Tra-cu (Tra-vinh), Vinh-châu, Vinh-phuoc (Bac-lieu), Lai-tâm, Va-

ap, Phuoc-lai and Yên-tâp (Soc-trang) cultivate mulberries, breed worms d weave the silk.

Cambodia.— All the banks of the Mékong between Tân-châu and Pnom-nh are planted with mulberries in the parts that are inundated every ar. On the borders of Cochin-China is the silk centre of Banam, in the ovince of Prey-veng, which has raised worms from the eggs of the Station Takeo (Pnom-penh).

The Upper Mékong seems to have a certain future before it from the icultural point of view; silk raising is much scattered; the resources Laos are imperfectly known, and unfortunately the attempts made in nking and Cochin-China have not been extended to this locality.

The breeds of silkworms in Indo-China.

They are polyvoltine, generally with yellow cocoons, exceptionally dirty te. It requires 18 to 20 lbs. of fresh cocoons to produce 1 lb. of raw reeled after the European fashion. The complete evolution of the worms s from 42 to 46 days: 10 for hatching the eggs, 20 to 30 according to the ther for the growth of the worms and from 10 to 11 for spinning and ation.

Annamese breeders distinguish the following four breeds: Bâu-bi, -diêu, Ken-se and Tâm-soc; their characters however are badly de-d. The writer gives some of them. The Tonking breeds are generally arger size.

Silkworm rearing.

The writer studies the native systems in order to draw the attention European breeders who would improve their defective details.

The breeders themselves attend to the egg-laying; the unit adopted he "cup" (the quantity of eggs laid by 4 or 5 fertilized female moths together under a cup). No selection is practised. Native breeders erally undertake the raising of a number of worms too great for their ilable space. Their yields are not remarkable, 22 to 28 lbs. of cocoons 100 layings, and often less.

Incubation does not require any special care. Hibernation is not prac-d. The eggs have only to be protected against red ants. Annamese eders remove the newly hatched worms only in the afternoon or the day er the first eggs are hatched, which has the effect of obliging those that hatched first to fast until the late ones come out. The young worms swept off with a feather, many being injured in the process.

Moulting lasts 24 hours; the longest of the stages, the last, is of eight rs. The food of the worms is frequently very imperfectly chopped l may contain fragments of wood which wound many worms. The rms are set to spin their cocoons on hurdles which yield up to 11 lbs. cocoons each.

The breeder does not usually spin the silk, but sells his cocoons to a nner at current prices minus a rebate of 1*d* per 11 lbs. in favour of the

spinner. When the worms have thriven well and produced cocoons suitable for reproduction they fetch as much as twice the price paid for cocoons for spinning.

The defects of native breeders are the following. They hatch too quantity of eggs much superior to their means (this applies specially to the Cochin-Chinese); being short of hands they hurry roughly through the various operations, causing injury to the worms; this injury is then attributed to occult powers, which the breeders seek to appease by superstitious practices instead of improving their methods of breeding. The most elementary rules of hygiene are unknown; the diseased worms are thrown about anywhere and become new sources of infection.

Diseases and enemies of silkworms in Indo-China. — The most widespread diseases are: "pébrine," "grasserie", "flacherie" and "muscardine"; a fly called "con-lang" also causes a good deal of damage.

Pébrine, called in Tonking "tam-gai", causes much less havoc in Indo-China than in France. It is beginning to decrease owing to the free distribution of selected eggs; the sale of unselected eggs should be forbidden and more lectures for the natives should be given.

Flacherie, called "tam-lung" in Tonking and "tam-di-duor" in Cochin-China, appears especially in the last stages.

Some worms cannot digest their food and die without exhaling the characteristic odour of flacherie; under the microscope they show bacteria in moniliform strings.

Another disease, called "atam-kuong" in Tonking, causes the worm to stretch out, and the third to the sixth ring to blacken; the last rings become transparent; the worm then dies and exhales a fetid odour.

Grasserie appears under various aspects, according to which it has various names; it is especially frequent in moist and stormy weather, causes much havoc and often destroys whole batches of worms.

Muscardine is rather rare in Indo-China and is not much dreaded by native breeders.

The "red disease" is not very serious; it attacks the moths, which die after having laid a limited number of eggs.

The fly "con-lang" deposits its eggs on the worms and secretes at the same time a corrosive liquid which attacks the skin and makes an opening in it, through which the egg penetrates into the worm where the larva feeds on the tissues of its host, reducing them to pulp; one worm can contain as many as 6 or 7 larvae. When the latter are fully developed they issue from the body of the worm by a large opening and enter into the crevices of the floor, where they pupate. The pupa is at first light brown, then black and it develops in about 12 days. In order to guard against this insect, breeders protect the worms during the first stages by a mosquito curtain. In Tonking the windows are closed by a fine bamboo network. This fly is in its turn parasitized by *Encyrtus sericophilus* (Hymenoptera), the study of which has been the object of a communication to the Académie des Sciences of Paris.

nother fly, called " rui dâ ", which resembles a wasp, attacks the when placed on the hurdles to spin their cocoons ; its sting is instan- isly fatal, but the damage it does is insignificant.

The silk industry.

hough the industry is established throughout the country it is still ery backward condition. Spinning in the European fashion is not sed by the natives ; there are in Indo-China only three filatures, two ing to Frenchmen at Nam-dinh (Tonking) and at Phuphong (Annam); ird at Thai-binh (Tonking) belongs to a native company. All three s improved plant.

he Annamese systems of spinning produce a raw silk unacceptable uropean markets.

he unit of cocoons in the filature is the " câu " of 11 lbs.; the unit ight for the cocoon trade in Tonking is a bundle of 600 " sapeks " an-tiên "), weighing 3.25 lbs., but considered in the French trade lbs. The unit for raw silk in skeins is 10 taels, or 9.25 lbs.

he thread of the cocoon that is formed in damp weather often breaks inning ; it yields a fluffy silk of inferior quality and is used to adulte- pun silk for export.

he floss is sold to the Chinese, who export it to Cholon, whence it ap- a certain quantity is sent to France to the silk by-product factories. stimated that in Indo-China the floss pays the labour and the firing pinning mills.

e raw silk obtained in Cochin-China is useless in Europe; the " to-lua " quality is utilized by the local looms, while the " to-be " quality is d by the Malays to Bangkok.

mam silk is exported to Hongkong and Singapore. Tonking silk, has improved thanks to the combined efforts of the Administration the Nam-dinh mills, finds its way in increasing quantities to France, ir-fifths of it still goes to Hongkong.

e native production is very low and is not sufficient for present ds ; consequently it does not seek other outlets. Nevertheless the made by the neighbourng countries, especially Siam, the Philip- and Corea, to extend their production, render considerable efforts in me direction necessary on the part of Indo-China. But there are eat obstacles to be overcome : 1) the lack of a technical direction ently endowed by the administration ; 2) the want of European fac- in Cochin-China and in Cambodia ; 3) the ignorance of the natives in l and especially of the spinners, and their lack of initiative ; 4) the of capital, interest on which is almost always 50 per cent. and ds, often reaching 100 per cent.

he first steps towards progress must be made by the administrative rities. The following would be useful measures :

1. Promoting in Cochin-China and in Cambodia the formation of e societies for reeling silk, under the technical direction of French ls. Such societies have given excellent results in Tonking.

2. Providing the natives with improved spinning apparatus, as already been done in Tonking, and granting prizes either to the spinne to the exporters according to experience.

3. Teaching the Annamese to reel off a fixed number of thr with knolled ends, replacing bamboo reels by aluminium ones, increa the twist and adjusting better the motion of the combs. A great de tact and a full knowledge of the industry are necessary in the officials are to induce the natives to adopt these measures, which would consider increase the value of Indo-Chinese silks even on Asiatic markets and cure profitable sales for raw silks.

4. The awarding of prizes in money and honours by the Gov ment.

Native weaving. — Silk is woven everywhere in Indo-China, but processes are not equally developed in all centres; Tonking and Annam more advanced than Lower Cochin-China.

In Tonking weaving is especially prosperous in the provinces of Ni dinh, Thai-binh and Kiên-an. Dô-son is renowned for its silks, a of taffeta called "lua"; in the province of Hâ-dông the village of La distinguished for its gauze called "the La-ca". With the exception the gauzes, taffetas, serges and satins which compete with the same Chi woven goods, the natives turn to China for their finest garments. Of Indo-Chinese countries, Cochin-China is the one which consumes greatest quantity of Chinese silks.

In Annam, fine satins, gauzes and crapes are woven at Binh-d The importation into France of Binh-dinh crapes continues to incre

In Cochin-China weaving is limited to plain silks and some taf with very small patterns. The most important looms of Cochin-Ch and Cambodia are those of the orphanage of Cu-lao-giêng, managed by Sisters of the Apostolic Mission: here taffetas are made with pattern Cambodian or Siamese style, 28 and 32 inches wide, as well as cr (foulards and shawls) with French hand embroidery. Tissues of the s kind are manufactured by the Malay cantons of Xom-châ-và (or Xom-ch giang) over against Châu-doc. The same Malays excel in the manufac of "sampots" called "châng hung" (a special kind of taffeta).

Indo-Chinese mulberries: their diseases and pests.

The mulberry cultivated in Indo-China is the white mulberry. T are many varieties of it, which have not yet been studied from the botan or the nutritive point of view. The native varieties may be reduce four: dâu-tau", with leaves cordate, thin, entire or lightly serrate; " phung", with trifid leaves; "dâu-se", small cordate leaves; "dâu-du" (papaw mulberry), with leaves deeply divided, somewhat like t of the papaw.

Enemies. — In the mountainous region of Châu-doc, where the mul ries are grown as standards, occurs a longicorn beetle, the larva of wh

holes in the trunk; this insect has no special name among the Annam-
he perfect insect gnaws rings in the bark of the branches.
he writer found in 1908 in the province of Ben-co some mulberries
ng from the attacks of an aphis lodged in the underground parts of
ee between the bark and the wood: the bark dries and falls off
rts attacked.
ermites cause serious damage to the mulberries planted on the dunes,
"giông".
he mulberries on the banks of the Mékong at Tân-châu are attacked
year in the dry season by a fungoid disease which curls up the leaves
ries them, rendering them useless. The trunks of the trees attacked
swellings and become brittle. The natives do not do anything to
t the disease, which disappears as soon as the rains come.

Fraudulent Introduction of Dead Lobsters in the Parcels sent to Market Certain Breeders. — JUGEAT in *L'Hygiène de la viande et du lait*, Year 8, No. 7, 341-343. Paris, July 10, 1914.

e wholesale death of lobsters caused in the breeding basins by the
on in the salt content of the water due to accidental infiltration of
ater, causes considerable losses to the breeders, a certain number
m do not hesitate to mix these dead lobsters with the live ones in the
they send to market, especially to Paris, where the writer on one
n seized no less than 295 lbs. of them. The flesh of these animals
very inferior quality; it is lean, dry, friable and tasteless; it turns
on being cooked and putrefies rapidly. It is therefore important
gnize such lobsters at once. Their characters are as follows:
1. *External characters.* — The muscles are completely relaxed, the
anes of the articulations are thick, dull and whitish (instead of being
hiny and transparent) and turn black in a few hours.
2. *Internal characters.* — The tissues are soft and swollen with wa-
a membrane be cut, water flows from the aperture, which never occurs
he animal is taken alive from the breeding basin.

FARM ENGINEERING.

Trial of Machine Ploughing in Rice Fields. — TARCHETTI, A., in *Il Giornale Risicoltura*, Year IV, Nos. 5, 7 and 8, pp. 65-80, 103-107 and 122-128. Vercelli, ch 15, April 15 and 30, 1914.

he Italian Experiment Station for Rice Growing at Vercelli organized
of machine ploughing in ricefields which took place on March 30, 1914,
Eusebio Saviolo's estate at Sali Vercellese, near Vercelli. Upwards
cres of land were placed at the disposal of the Committee; the fields
very uniform and large, so that the average length of the furrows
out 1000 feet, and the plot assigned to each machine about 7 ½ acres.
he following eight machines were admitted to the competition:
tor-hauled ploughs BARONCELLI, of Ravenna, Italy; FERRETTI GOGGIA, of Tortona, Italy.

B. Self-contained motor ploughs — PAVESI TOLOTTI, of Milan, Italy; S... of Berlin, Prussia.

C. Cable-hauled ploughs — CASALI, of Suzzara, Italy; SANTACH... of Reggio Emilia, Italy; VIOLA... SCARA, of Ariano Polesine, Italy.

D. Rotary digger — V. MEYENBURG, of Bâle, Switzerla...

1. *Baroncelli's motor.* — 24 H P. (effective), 800 revolutions minute, total weight 3960 lbs. — Has been somewhat modified to the special requirements of rice fields; the diameters of the wheels have increased, as well as the breadth of their tyres.

2. *Ferretti-Goggi motor.* — 24 to 30 effective H P., 500 revolu... per minute, total weight 9 900 lbs. — Its wheels are on the Lefebv... Holt Caterpillar system ; that is they run on an endless chain of steel pl...

3. *Pavesi and Tolotti's "moto-aratrice"* or self-contained plou... 16 to 20 effective H P., 700 to 800 revolutions per minute, total w... 4180 lbs. — In this machine the steering wheel has been enlarged an... the tyres have been widened.

4. *Stocke's motor plough.* — 42 to 50 HP, 700 revolutions, total we... 11 000 lbs. — This machine has also been somewhat modified in vie... the special work before it.

The three cable-hauled machines (5, 6 and 7) are all on How... single-engine system, with a separate windlass bearing two drums a... cable running round the field, though they differ in the construction o... windlasses and in other particulars.

5. *Casali's apparatus* was presented with a 13 effective HP, h... oil motor, built by the National Gas Engine Co. (Ashton); the two-wh... windlass truck, with 1600 to 2000 feet of wire cable, weighs 3 550 lbs.

6. *Santachiara's* windlass was presented with a Garret 12 effec... HP steam engine ; it is mounted on a four-wheeled truck and we... with 1600 feet of wire cable, 3960 lbs.

7. *Violati-Tescara's* outfit was entered with two different mot... one is a heavy oil Mietz and Weiss 25 effective HP motor, and the o... an electric three-phase motor of the same horse-power.

8. *Meyenburg's rotary digger.* — 25 effective HP, 1000 revolut... per minute ; the drum bearing the diggers makes 180 revolutions minute. Its total weight is 4400 lbs. and its breadth of work 6 ½

Of the above outfits, Nos. 3, 4 and 8 require only one man to ... them, while Nos. 1 and 2 require two men and Nos. 6 and 7 require fo...

All the machines entered finished off the work allotted to them, e... the electric motor of No. 7, which did not arrive in time for the tr... March 30.

The points given by each of the 19 judges were 70, distributed as fol...

20 for quality of the work done
20 » cost
10 » ease and safety of handling and transporting
10 » regularity of work of motor and suitableness to other purpos...
10 » construction and solidity.

70

he following were the awards :

Group of cable-hauled outfits:

CASALI	1 222 points
VIOLATI-TESCARA	1 215 »
SANTACHIARA	1 102 »

Group of direct-traction outfits:

BARONCELLI	1 170 points
STOCK	1 108 »
PAVESI-TOLOTTI	1 051 »
FERRETTI-GOGGI	960 »

Experience with Motor Plou hs in the Cultivation of Moor Soil. — *Pro-oll der 72 Sitzung der Central-Moor-Commission vom 15-17 Dezember* 1913, pp. 164-202 21 figs. Berlin.

n the 72nd sitting of the Central Moor Commission, four members, Ramm, Herr Volckmann of Kienberg, Herr Schmig of Etzin and Falke of Leipzig, reported upon their practical experience with motor hs. The earliest experiments were those begun in 1907 at Wies- ; electric machines were used, as the steam ploughs then existing ed too heavy. The division of the land to be worked into fields is n in the accompanying figure. The arrangement of the electric line ht angles to the roads requires long cables, but on the other hand es expense on the permanent lines and on the roads. When each is provided with 2300 feet of cable, cross-roads are required only 600 feet. With steam ploughing the arrangement is the same hat the cross roads with power lines are not necessary.

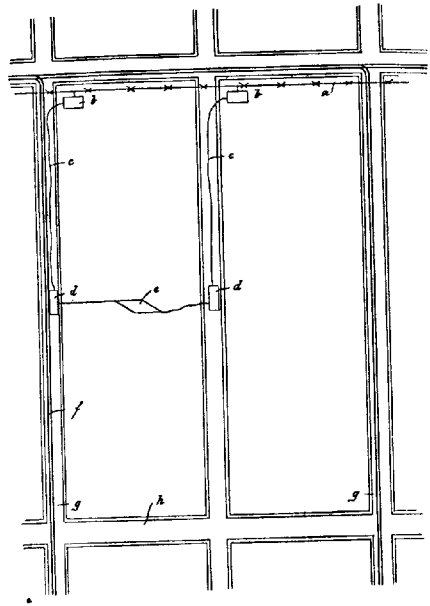
er several trials, satisfactory results have been obtained. Plough- lectricity costs from 5 *s* 11 *d* to 6 *s* 8 *d* per acre ; a steam engine ng itself along the moor roads and burning peat costs 5 *s* 7 ½ *d* *d* per acre. The lower figures represent the cost with favourable and with a long duration of work.

anks to the experience gained the windlass (anchor) trucks were cted in such a way that they did not require a road to be made for In order to prevent their being dragged sideways by the powerful put upon them they are fitted with large hook-like attachments ress against the side of the ditch on the edge of the field and slide like a sledge when the truck moves forward.

regards the ploughshare, experiments are now being made in order rtain whether a share which turns the furrow-slice completely over has been found suitable in fens) is advisable for these moors.

xperiments with cable-hauled disk-harrows have been successful ose with rollers also. For roller work, with the exception of that rough ploughed land, motor rollers are now used and have proved sful. They can be made heavier at will and are so arranged that an haul a manure spreader at the same time.

Arrangement of moor land for electric ploughing at Wiesmoor.



EXPLANATION.

a. Electric line.
b. Transformer truck.
c. Cable.
d. Electric windlass.
e. Plough.
f. Portable field railway.
g. Sanded road.
h. Road not sanded.

Each plot measures 550 × 1540 yds.

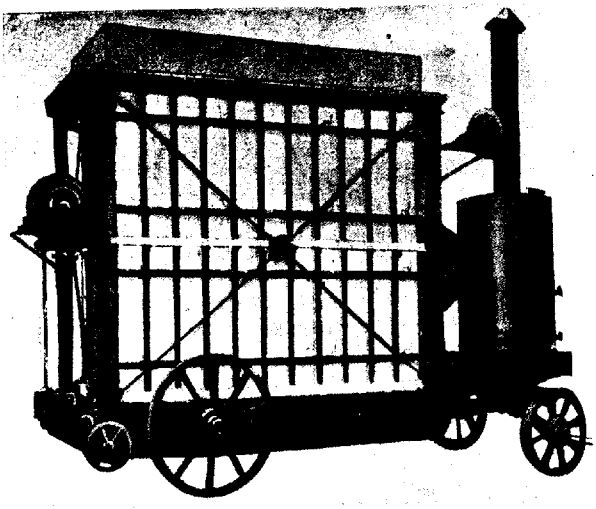


Fig. 1. — Side wiew of paddy esiccator.

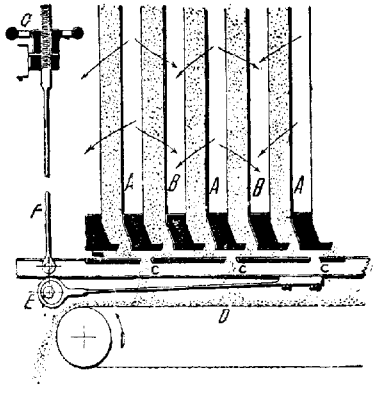


Fig. 2. — Partial longitudinal vertical section of paddy esiccator.

At Kienberg a two-engine Ergomobil plough and a rotary digger have
good results.
At Etzin a two-engine benzine motor outfit has proved very suitable
eep soft moor soil. The 24 HP motors ploughed 0.62 acre per work-
our. On dry hard soil, however, the motors are not powerful enough ;
should be at least 30 HP.
At Hartenholm the motor plough has been successful on waste land
had been once broken up, but it is not yet known how it would behave
he rough virgin moor.
On the whole the reports show that the efforts for the construction
otor ploughs suitable for moors have yielded good results.

- **A New Esiccator for Paddy.** — TARCHETT I., A., in *Il Giornale di Risicoltura*, Year IV, No. 6, pp. 88-90. Vercelli, March 30, 1914.

A new type of portable paddy esiccator has been designed and built Geminardi, Guidetti & Co., mechanical engineers, of Vercelli, Italy. ide view of the machine, which is simple and strong, is shown in fig. 1, part of its longitudinal section in fig. 2.

The paddy is fed from the top into a series of vertical parallel chambers nt 2 ½ inches wide and separated from each other by air spaces, A, B, he same width. The hot air from the generator first enters into the ces A; as these are closed at the top it is forced to pass through the rice the spaces B, whence it escapes into the atmosphere. The tempera- e of the air is regulated by suitable slides in the hot air generator and the fan.

The dried paddy issues through a slot in the bottom of the vertical mbers and falls onto the horizontal plane, CCC, which moves forwards l backwards by means of an excentric and connecting rod, and thence o a canvas carrier which delivers it at one extremity of the machine.

The amount of rice passed through the esiccator is regulated by chan- g the speed of the excentric and by raising or lowering the plane C by ans of the screws in G.

The vertical chambers in which the rice is dried are formed by light n frames on which wire netting is stretched and which slide easily into oves in the framework of the esiccator.

The machine can hold about 112 cwt. of paddy.

- **Artificial Hay-Drying.** — *The Country Gentleman*, Vol. LXXIX, No. 22, p. 1033. Philadelphia, May 30, 1914.

In many countries a great deal of hay is more or less spoiled or even mpletely lost every year by the heavy dews and rains of the haying ason.

Several years ago T. P. Russell, a Southern Missouri farmer, wrote the United States Department of Agriculture to ask whether the artifi- l curing of hay was not an economic possibility. The office of Farm Ma- gement began to investigate the question at his farm from 1907 to 1913 d now the problem has been solved.

Hay can be cured at a profit, be it green, half cured or soaked w rain-or dew. Freshly cut grass covered with dew or rain and contain 70 to 80 per cent. of moisture can be cured in 20 to 40 minutes into h containing 10 per cent. of moisture and this hay can be baled immediat on leaving the kiln and will keep indefinitely.

The above-mentioned office has erected an experimental plant for t curing of hay; it is practically a barn heated by a steam boiler. At one end the barn is a feeder chute into which the green or wet hay is fed as it com from the fields. As it enters the chute it is caught on slowly moving be which carry it round and round the heated interior of the barn, finally brin ing it out at the other end cured and ready for baling or for storing loc

The existing plant is worked at a steam gauge pressure of 80 or 90 l which gives a maximum temperature of 260° F. (126 °C.) at the bottom the drier, and 223° F. (106 °C.) at the top.

The hay it turns out is superior in colour to field-cured hay and a very sweet aroma, and in repeated tests the animals before which b kinds of hay were placed ate the former first and often refused the lat

Analysis shows that the drier-cured hay differs little from the uncu grass and is superior to field-cured hay. The protein content, on a wa free basis, is 19.15 for uncured grass, 18.70 for drier-cured hay and 1 for field-cured hay. This difference is partly due to larger leaf comb

Mr. Mc Clure, the official of the Farm Management Office, gives following estimate for a hay-drying plant capable of turning out 1 ½ or more cured hay per hour:

Excavation	$ 104.00
Kiln superstructure, walls, roof, settings for conveyors, etc.	$ 2 160.62
Doors, hinges, guide plates	$ 233.73
Engine shed	$ 300.00
Painting and glazing	$ 281.20
Conveyors, drive, fans, turbine, elevator, regulator, castings boiler and other machinery	$ 10 422.00
Contingencies	$ 2 500.00
Total	$ 16 001.05

Of course no farmer of ordinary means can afford to invest such sum, but large owners and cooperative associations could easily do

As for the cost of artificially curing hay, at the experimental pl in S. Missouri it was found that a ton of cured hay required 1.3 tons coal. According to other experiments, however, it is asserted that i 1500-ton drier the fuel requirements would be reduced to 0.6 ton of c to one of cured hay. The total cost is given in table I.

Considering the advantage of assuring the regular output of cu regardless of weather, and the increased nutritive value of the hay p duced by artificial means, it is safe to say that though artificial curing will not take the place of sun or field drying where and when good haying w ther prevails, it will enable the grower so to cure his entire crop that will all grade as "choice" and thus command the highest prices.

TABLE I. — *Cost of artificial hay drying.*

	When a ton of coal costs		
	2.50	3.50	4.50
ist based on 0.6 ton of coal per ton of cured . . . . . $	1.50	2.10	2.70
abour, interest, maintenance, etc. . . . . $	2.97	2.97	2.97
ost of curing from standing grass to baled hay rm . . . . . $	4.47	5.07	5.67
st of curing one ton in field . . . . . $	2.60	2.60	2.60
$	1.87	2.47	3.07

Besides the above investigations, the Office of Farm Management xamined the possibilities of a plant operated by direct heat. The consists of a sheet-iron box, 6 by 3 by 3 feet, equipped with a sliding containing damper and thermometer connecting this firebox to the ıx of an ordinary steam boiler. It was fitted with woven wire trays olding hay and a fan.

With this equipment the drier could be operated up to 700° F. (370° C.), with an air circulation through the drier up to 4 500 feet a minute. e II gives the results of experiments with this direct heat drier.

TABLE II.

Velocity in discharge	Temperature		Time required to cure	Protein
	Front (1)	Rear (1)		
t.	deg. F.	deg. F.	minutes	per cent.
500	600	250	8	18.81
200	640	260	5	17.62
300	450	220	15	17.50
650	400	200	15	19.50
800	400	250	15	18.69
800	350	225	20	17.61
200	600	415	15	24.69
800	320	200	10	19.75
400	320	215	20	20.38
sun at ordinary temperature (2)				21.31

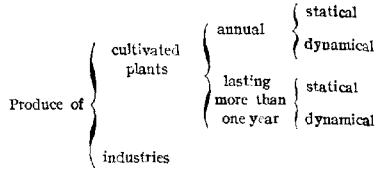
Front" where the hot air first comes into contact with the hay ; " Rear " where the air has rough the hay and is ready to be discharged from the drier by the fan.

his sample was carefully cured without the loss of any leaves and therefore does not truly ordinary field-cured hay.

RURAL ECONOMICS.

845 – **Statistical Research on Farm Produce.** — MARENGHI, ERNESTO. Extract from the "*Giornale degli Economisti e Rivista di Statistica*", Part I, pp. 1-31 + 2 — *Atheneum*. Rome, 1914.

As an introduction to his research, the writer draws up the following scheme of farm produce:



I. — THE PRODUCE OF CULTIVATED PLANTS.

A: The group of statical annual produce. — To this belongs the p of herbaceous crops, as well as that of woody plants submitted to re cultivation, that is subdivided into as many groups of the same age as th are years in the whole cycle of production.

This produce is *statical* on condition that the systems of cropping not vary. The relative succession of these products may acquire incr ing *dynamical* character only if the systems of cropping improve or dete rate, or if new enemies or modifications of physical environment appear; apart from these factors, the annual range of these products represe by a Cartesian diagram gives rise to a broken line, the general trend of wh is parallel to the axis of the abscissae. The phenomenon of productio these crops belongs therefore to the group of those which are expre quantitatively with sufficient approximation by the arithmetical me of a sufficient number of cases. In practice it is suggested to extend same observation to a period of 10 to 12 years, which is justified also theory. The writer, however, observes that in periods of very rapid inten cation of agricultural production it is well to restrict oneself to the com rison of a still more limited number of terms, because to every succes stage of progress for a given crop a different *normal production* corresp The idea of normal production is nothing absolute in itself, as it can refer to sharply defined conditions of cropping, case by case.

B: Group of *yearly dynamical produce.* — To this belongs the prod of ordinary woody plants not subjected to yearly management. This duce varies from time to time, not only through accidental causes the statical, but also as a function of the age of the plantations, gi rise to very characteristic dynamical chronological series which serve the construction of the law of production concerned. The *normal of production* of woody plants varies from case to case as a functio many factors: species of trees, system of management etc. One of

lamental aims of economic statistics is that of investigating these
es by suitably applied methodical observation.

With this object the writer proposes to replace *observations in time* which
ire long periods of time, by *observations in space*, by recording the ac-
yields of woody plants in similar regions, separately for the plants
ach age.

When this observation has been continued for a certain number of
s, for instance 10 or 12, there will be sufficient material to determine
normal curve of production, assuming as the normal produce of the n^{th}
of age the average of the produce ascertained on trees of that age
ng the various years of observation. The series of the normal yields
obtained is the numerical expression of the normal curve which is
ght.

The writer notes that by the same process, in the short space of one
the data sufficient to draw a *gross curve of coexistent yield* may be col-
ed, and that this may lead to the normal curve when the ratio between
actual unit yield of the year under observation and the average of the
on under investigation is known. Thus, representing the equation of
gross curve by

$$y = f(x)$$

normal one will be :

$$y = K f(x),$$

which K is the ratio defined above. The writer obtains similar results
the hypothesis that the methods of management do not vary sensibly)
the data of a *gross series* of *successive yields*, the perfecting of which
be obtained by arithmetical, algebraical or graphical means. The
is the simplest of all: it consists in substituting for every term of the
es the arithmetical means of the three, five, seven, etc., terms of which
the middle one (Wittstein's method). The *algebraical* process consists
ntially in replacing the gross curve by a simpler one which it is as-
ed corresponds to the real law of the phenomena. The problem is
ed by causing a curve of a certain order to pass through certain points
er determined conditions according to the method of interpolations.
geometrical or *graphical* method consists in representing the gross
es by a Cartesian diagram and in interpolating in it a curve which
roaches the same series and then determining according to scale the
ues of the ordinates corresponding to the theoretical curve.

The writer then discusses the fragmentary series and the process of
rpolation based on the hypothesis, which corresponds with sufficient
roximation to reality, that the yield of woody plants varies approxi-
tely according to geometric progression provided the intervals consi-
ed be not too long and the accidental oscillations be neglected.

This process of interpolation finds its analytical expression in the fol-
ing formula, which allows the missing data of the series to be inter-
ated :

$$y = K \alpha \rho^x.$$

in which :

y = average yield of the plant at the age of $\alpha + x$

$K\alpha$ = average yield of the plant at the age of α.

ρ = constant ratio of variation

x = independent variable quantity which gives the age of th plant in any year of the interval considered, supposed to be of n years

It follows that setting $K\sim$ for yield at the end of the same, th equation

$$K \alpha \rho^{n-1} = K\sim$$

is obtained, from which the following results :

$$\rho = \sqrt[n-1]{\frac{K\sim}{K\alpha}}$$

This process of interpolation thus consists in the analytical represent tion of the production of woody plants bearing annual produce, not by mean of a single curve (in which case the approximation would be too wide but with several and successive branches of curves connected with each othe These may be considered as the expression of as many empirical laws c the phenomenon that is investigated, each of them being, with sufficien approximation, with certain limits of age of the same plants.

The exactness and the value of the process of interpolation may b experimentally checked when suitable statistical data are available.

The writer notes in this connection the low trustworthiness of the st tistical data existing as to the curves of production of woody plants bearin yearly produce, and the necessity of systematic observations of the sam in order to collect valuable material for the solution of the most varied ec nomic problems.

C : The group of polyannual produce. — To this belongs the princip production of woods not under regular rotation. These woods are eith high forest, in which case the cycle of the formation of the product coincid with that of the plant, or they are coppice, and then it is a submultiple the latter. The distinction is of a certain importance for these statistic researches, since high forest gives rise to a *chronological series of statistic produce*, whilst coppices — at least in some cases — gives rise to *dynam series*.

The data that are necessary and sufficient to individualise the fund mental production of woods are two : the *physical quantity* (discriminat if necessary in selected groups or otherwise) and the *extent of the correspon ing cycles of elaboration*, which are not fixed as they are for the annual pr ducts, but are susceptible of being varied within certain limits with the o ject of realizing a maximum profit, other conditions being equal. Thus t curve of the increment of wood in forest plants is characterized by the pr gressive decrease of the rate of increment; during this progressive dim nution the limit of profitableness is reached when the rate of wood incr ment expressed in money coincides with the rate of interest.

D: *The indices of variability* of crops and the ways of determining them.
rop, other conditions being equal, presents less risk the steadier its pro-
tivity, which is expressed by suitable figures called *indices of variability.*
e of the indices most frequently used for statistical series is obtained
dividing the square of the mean deviation of the mean of the fields
ing the various years of observation from the arithmetical mean of the
ole period by this latter mean.

The writer notes that these indices of variability are not liable to gene-
lization but are strictly connected to the special conditions of environ-
nt and proves by means of suitable examples that the range of the yield
the same crop varies within very wide limits from one locality to another
a function of many circumstances.

II. THE PRODUCTS OF AGRICULTURAL INDUSTRIES WHICH RESULT IN A
RE OR LESS ELABORATE TRANSFORMATION OF CROPS.

The ratio (at least approximately) between them is *constant* in some
es and *variable* in others. It is constant, for instance, in the transformation
grapes, olives etc., but variable in that of forage crops. The statistical
estigations to be carried out in the first case are not many, it being
ugh to determine the coefficient of *yield per unit.* If this ratio is va-
ble the *law of variation* has to be sought according to the systems of
thodological statistics.

The writer restricts himself to a consideration of the production of
k and of meat.

The production of milk varies — for every individual kind of cow —
ording to many factors: breed, age, diet, stage of lactation, etc.
order to get the principal characters of the process, a sufficient number
animals have to be subjected to experiment and they have to be
uped according to age, diet, or other factor, in agreement with
problem to be solved. Supposing the factor considered be age, the
rage individual yield of the animals under observation will have to
determined for each class of age. The series of average yields obtain-
will give the curve of the facts as functions of the age; this can be
ther simplified by transforming the individual terms in index numbers,
it is by making the first term equal to 100 or 1000 and reducing the others
proportion.

The writer reports some data collected on a group of Simmental cows and
es that the general trend of the curve of the annual individual mean
ows a certain analogy to what is observed in the production of woody
ants bearing fruit yearly.

The writer examines similarly the influence of the time that has elapsed
m the beginning of the lactation on the yield of milk, and from the in-
idual chronological series obtained from a Swiss cow belonging to the
ugia Agricultural Institute he finds the corresponding normal curve
means of a suitable process of equalizing. The production of milk
the months following calving diminishes very nearly in geometrical

proportion and consequently the normal curves may be represented a lytically by functions of the type of:

$$y = p_1 \rho^{x-1}$$

in which
y = milk yield of any month x.
p_1 = milk yield of the first month after the birth of the calf.
ρ = a constant ratio to be determineed either by the method of least squares or, simpler still and with sufficient approximation, by tak the average of the actual ratios which are obtained by dividing every te by the one which precedes it.

In a special table the writer compares the actual series of a grou Swiss cows with the theoretical series and notes that the agreement b ween the two is more than satisfactory. Even on the hypothesis that the tual series should present some gaps, the ratio ρ of variations could be equ determined (though less exactly) and the analytical formula could be fo and it would among other things allow the whole series to be reconstru and the total corresponding yearly production to be determined.

Submitting to a similar process some data relating to the produc of flesh, the writer notes that the series of the increments of weight unit in young and in adult animals in course of being fattened gives ri a descending curve which turns its convexity to the axis of abscissae which may be represented — as in the case of milk yield — by an equ of the type of:

$$y = p \rho^x$$

The development of animals by weight follows the economic la increasing production. A gradually diminishing increment by weight corr ponds to an increasing consumption of fodder. Admitting as a fairly p bable hypothesis that the rations of animals are homogeneous for ev group and directly proportional to their weight, the writer infers that above equation represents also the action of the said law as regards production of flesh.

846 - The Position of Non-Breeding Dairy Farms in Modern Agriculture.
BRINKMANN, THEODOR, in *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part pp. 433-449. Stuttgart, July 1, 1914.

The subject of dairy farms which do not breed their cows, especi in their importance from the point of view of social economy, is m discussed at present. The writer studies the problem exclusively fr the point of view of rural economy and proposes to answer the two follo ing questions:

1. Is it justifiable from the economic point of view to keep dairy c without breeding them, and if so under what general conditions is this be preferred to dairy farming with breeding?

2. What are the effects of the present changes in the condition the industry and of agricultural production upon the profitableness of

ival systems? Do they affect both systems equally or do they one more than the other?

— Both systems are intended to utilize to the utmost the fodder ed on the farm itself, and this especially by transforming it into milk. n-breeding dairy farm can, with the same quantity of fodder, produce larger quantities of milk than the breeding dairy farm, because mer keeps only milk-producing animals; further it possesses another age from the point of view of the utilization of milk in that while breeding farm a part of the milk produced is consumed by the calves, her type can utilize at will all the milk that it produces and may regulate its production to suit the demands of the best possible tion. These advantages ensure the non-breeding dairy farm gross s in money which are fairly high in comparison to the quantity of to be utilized. This, however, cannot be obtained without a relat- igh cost of production, caused especially by the loss, which in general iderable, entailed by the purchase and sale of cows, by the necessarily ive feeding and great consumption of concentrated foods, by the ely high price of labour and by the considerable risk attendant upon ntinual purchase of strange cows.

From these considerations it is evident that the conditions which jus- e existence of non-breeding dairy farms are present when it is possible lize the large quantities of milk produced in the farm in such a way the receipts balance the high cost of production. If the price of the increases gradually, a point must be reached at which the advantages by the high gross yield are superior to the disadvantages caused by igh cost of production. This is clearly shown by Table I (1), in the yield in milk and the gross returns in cash for the different prices lk have been calculated, then the cost of keeping the cattle, that of oncentrated foods and lastly the difference between gross returns outlay, that is the net returns obtained by utilizing the fodder at ifferent prices of milk, referring all the figures to 100 kilos (220 lbs.) arch value of the fodder produced in the farm itself. These calcula- s have been made for three different groups of farms: 1) dairy farms h do not breed their cows; 2) dairy farms which breed a part of their g stock; 3) dairy farms which breed all their stock.

The division of labour which exists under these two systems of dairy ing is thus perfectly justified as an economic necessity, as a conse- ce of the variations, from one farm to another, of the net returns ined by the utilization of milk. After all the problem of the non- ding dairy farm is only a question of the price of milk. Nevertheless conclusion cannot be drawn that a limit of fixed profitableness, true r all conditions, can be established between the two systems; on the rary, the deciding limit in the price of milk must be determined sepa- r in each case, as it depends upon the special conditions of each farm:

1 This table is taken from FUNK: Die landwirtschaftlichen Betriebsverhältnisse der ichen Milchwirtschaften im Havelland. — *Arbeiten der D. L. G.*, Part 169.

TABLE I. — 100 *kg.* (220 *lbs.*) *of starch valu*

	Number of farms	I. Supply				
		Gallons	Gross receipts in cash when the price of per gallon is:			
			d 6.44	*d* 7.48	*d* 8.56	*d* 9.60
			s d	*s d*	*s d*	*s d*
In dairy farms which do not breed	23	50.25	26 9 3/4	31 3 1/4	35 9	40 2 3/4
In mixed dairy farms. . . .	21	45.50	24 4	28 4 3/4	32 5 1/2	36 6
In breeding dairy farms. . .	13	34.75	19 2	22 4 3/4	25 6 3/4	28 9

its size, the quality and quantity of the fodder to be utilized, the requi ments as to the production of farmyard manure, the professio capacity of the farmer and the amount of his capital. In general it m be said that the conditions to warrant the division between the two syste exist only where the milk is sold as such.

II. — It is evident that in the course of time the limits of the areas occ pied by each system shift in consequence of the changes which occur the conditions of profitableness. The expenses due to certain factors production, chiefly those which weigh heavily on farms that do not bree have increased considerably of late years. This is especially the ca with concentrated foods and the losses caused by restocking the stabl and with the price of labour.

On comparing the average prices of the two periods 1901-03 and 1909-1 an increase of 14 per cent. is found in the price of earthnut cake, 12 p cent. in cotton seed, 17 per cent. in coconut cake, 18 per cent. in whe bran and 23 per cent. in brewer's grains. The increase in the price of labo and the decrease in the quality of the work done are notorious. The increa of the cost of concentrated foods and of other expenses weighs also on t budget of breeders, but not so heavily as on the non-breeding dairie which spend almost twice as much as the former on concentrated foo (see Table). Furthermore there has been, since 1900, a rapid rise in the pric of milch-cows, amounting to £ 5 to £ 6 per head in the Rhine Provinc Though the increase in the price of milch-cows has been partly balanced b the increase in the prices of fat cattle, this rise in the price of cat weakens considerably the position of non-breeding dairies, for in the com petition between the two systems the increase in prices injures the o and benefits the other, since the high prices paid by the non-breedi dairies are an advantage to the breeders.

It is undeniable that of late years there has been a considerable i crease in the sale price of milk, but according to the writer the consequ increase of the gross returns has not been sufficient to counterbalance t

roduced on the farm (hay, straw, mangolds, etc.)

II. Require the following expenses						III. Yield a net profit when the price of milk per gallon is:									
our, st, ment ing al, ation ck	for purchase of concentrated foods			Total			d 6.44		d 7.48		d 8.56		d 9.60		d 10.72	
er gal.	s	d	per gal.	s	d	per gal.	s	d	s	d	s	d	s	d	s	d
d			d			d										
1.96	13	$7\frac{1}{2}$	3.28	21	$10\frac{3}{4}$	5.24	4	11	9	$4\frac{1}{2}$	13	$8\frac{1}{4}$	18	4	22	$9\frac{1}{2}$
1.92	10	$6\frac{1}{2}$	2.80	17	10	4.72	6	6	10	$6\frac{3}{4}$	14	$7\frac{1}{2}$	18	8	22	$8\frac{3}{4}$
2.16	5	$3\frac{1}{4}$	1.76	11	8	3.92	7	6	10	$8\frac{3}{4}$	13	$9\frac{3}{4}$	17	1	20	$3\frac{1}{2}$

eased cost of production. And if such were really the case the consider- increased chances of profit in breeding caused of late by the conditions he market would always signify a sensible loss for non-breeding dairy ns. The fact is that during the last ten years the profits of cattle breed- farms have considerably increased, both absolutely and also relatively hose of non-breeding dairy farms; it is this latter fact which settles matter, because the question of the profitableness of a branch or a em of farming does not depend upon this branch or system paying its enses absolutely, but rather upon its bringing in more profit than any er branch which might replace it.

The weakening of the position of non-breeding dairy farms will be l better understood when it is considered that the technique and the rovement in the means of communication and other factors tend ays more to abolish the monopoly in the supply of fresh milk which merly belonged to the districts of production nearest to the markets. ny and various circumstances concur in rendering easier the supply of k to the centres of consumption, such as the facilitations offered by the ways for the carriage of milk, the better preservation of fresh milk due ystematic treatment, the ease with which milk can be obtained from ant districts thanks to a series of organizations of producers, traders sometimes of consumers; all these factors and others also act in the e sense, favouring the offer of milk and opposing the increase of its price, increasing the utilization price in new districts of production and entralizing the production of fresh milk. The creation of new dis- cts of supply tends to equalize the local prices of milk and the intensity roduction in the districts of supply. Those that are situated at greater ances may adopt a more intensive system; all of them, however, approach average line in their degree of intensity. Thus, the farms which intermediate between the non-breeding ones and those which breed their stock are especially favoured by recent developments and will rease in importance.

847 – **The Organisation of Team Work according to the Results of Bookkeeping and to Net Returns.** — OSTERMAYER, ADOLF, in *Mitteilungen der landwirtschaftlichen Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. II, Part 3, pp. 411-431. Vienna, 1914.

The expense for the work done by draught animals is a large item in the total working expenses of a farm. Calculated on the results of book keeping they have been found to be as follows, when expressed as percentages of the total cost of production.

For cereals	in the plains	11.0 %
	in the mountains	17.2 »
For beets	in the plains	24.9 »
	in the mountains	28.2 »
For potatoes	in the plains	19.9 »
	in the mountains	18.3 »
For hay	in the plains	13.5 »
	in the mountains	11.4 »

The range of the amount of these expenses exerts a great influence upon the net returns of the whole farm, as the writer proves with the aid of the books of 61 Moravian peasant farms. The average net return of these 61 farms is 19*s* 11 ½*d* per acre and corresponds to a rate of interest of 3.5 per cent. on the average capital of £28 4*s* 0½*d* per acre. This result has been obtained at the average cost of 2*s* 11*d* per day's work per animal and an average number of 4.66 days per acre, which brings the expenses of team work to 13*s* 8*d* per acre. With the help of these figures the writer calculates the net returns which correspond to the range in the cost of the day's work of the animals from 2*s* 1*d* to 3*s* 11½*d*.

	s	*d*		£	*s*	*d*	
When the work day costs	2	1	the net returns are	1	3	8 ½	per acre
» » »	2	6 ½	» » »	1	1	8	»
» » »	2	9 ½	» » »	1	0	5	»
» » »	3	2 ½	» » »		18	6	»
» » »	3	5	» » »		17	7	»
» » »	3	10	» » »		15	9	»
» » »	3	11 ½	» » »		15	2	»

Among the components of the cost of the work of draught animals the cost of feed and wages exert a decisive influence, as may be seen from Table I, in which the total cost of the day's work of an animal has been divided into its component parts for three groups of farms, each of them presenting different amounts for the keep of their draught animals.

TABLE I. — *Composition of day's work of teams.*

	Average cost of a day's work	Daily outlay					Partial items in percentage of total outlay				Actual number of work days out of 100 available days
		Fodder	Labour	Amortizement and interest	Sundries	Total	Fodder	Labour	Amortizement and interest	Sundries	
	s d	s d	s d	s d	s d	s d	%	%	%	%	
. .	2 3½	– 9	– 6	– ¼	– 1½	1 4¾	53.6	34.6	2.4	9.4	60.9
. .	2 8	– 10½	– 2	– 1	– 1	1 2½	70.7	14.1	6.9	8.3	45.8
. .	3 8	– 11½	– 5½	– 1	– 1	1 7	58.9	28.6	5.8	6.7	43.1
. .	2 11	– 10½	– 4½	– 1	– 1½	1 5½	60.8	26.1	5.1	8.0	46.5

able I shows also that the cost of an animal's day's work does not s follow the cost of keep, because it depends also to a great extent the degree of effective utilization of the draught animals. Conse- ly this utilization has a great influence on the net returns, as may be n Table II, which shows the average net returns of several groups of arranged according to the degree of effective utilization of their teams.

E II. — *Average net returns of groups of farms arranged according to the degree of effective utilization of their draught animals.*

Group	Small farms		Medium farms		Large farms	
	Degree of effective utilization	Net returns per acre	Degree of effective utilization	Net returns per acre	Degree of effective utilization	Net returns per acre
		£ s d		£ s d		£ s d
. . . . .	98.3	1 15 4	72.5	2 10 7	62.2	1 14 0
. . . . .	76.3	18 7	54.7	1 13 10	48.5	1 13 6
. . . . .	51.9	9 10	36.8	1 4 1	41.5	1 8 0

he same results are obtained by grouping the farms according to net returns and calculating for the groups thus formed the average ve utilization of the draught animals, as in Table III.

TABLE III. — *Average utilization of draught animals by groups of farms arranged according to their net returns.*

Group	Small farms		Medium farms		Large farms	
	Net returns per acre	Degree of effective utilization	Net returns per acre	Degree of effective utilization	Net returns per acre	Degree of effective utilization
	£ s d	%	£ s d	%	£ s d	%
I	2 5 11	95.8	3 17 3	58.7	3 8 3	9
II	0 18 8	82.2	1 12 6	54.0	1 0 11	5
III	—0 7 1	70.9	—0 4 4	53.1	0 2 0	4

With one exception the net returns diminish with the degree of effective utilization, so that the most intense and regular utilization of available draught animals is a fundamental factor for obtaining satisfactory net returns.

Nevertheless in organising the work of draught animals there is another problem also to be solved, namely that of suiting the animals to the nature of the farm, not only according to their number but also according to the different kinds of draught animals. As such, horses, oxen and cows must be considered, and they differ from each other by their individual character, pace, intelligence, facility of being driven, etc., and by the cost of their keep. The writer calculates the influence of the size of the farm, of its situation, of the intensity of farming, of the intensity of hoed crops and the outer and inner means of communication, on the conditions of the work of the draught animals in the 61 Moravian peasant farms, and illustrates by means of diagrams the employement and the degree of utilization of the different kinds of draught animals in the farms, divided into two groups according to the amount of the net returns. The results of these calculations are set forth in Table IV.

In small farms the great use of the cow as a draught animal is not advantageous; a too liberal use of horses and oxen causes a decrease in the net returns; on the other hand in large farms the work of horses is very advisable and it should be completed by that of oxen only to a limited extent, because large farms require team work more continuous than small farms and horses are more suitable than cattle, and especially cows, to continued work.

In well organized mountain farms the work of horses is much employed to a lesser degree that of oxen, while cows are only used as a temporary reserve during the busiest time in the summer. The increase of the number of oxen and the simultaneous reduction in the number of horses causes a decrease of net returns. Similarly in the plains the best utilization of the draught animals is obtained only by the supplementary use of the labour of oxen, though the number of horses is by far superior to that of the oxen. The organization of the team work in intensive farms with high net returns resembles very closely that of well managed plain farms

			Small farms, less than 24.7 acres	Large farms, over 74.1 acres	Plain	Mountain	sive / sive — Working expenses per acre: over £5 1s 2½d	sive / sive — Working expenses per acre: under £5 1s 2½d	sive / sive — Hoed crops: over 12 %	sive / sive — Hoed crops: under 12 %	Distance from market: under 3.11 miles	Distance from market: over 4.66 miles	Rounded property and fields near farm	Scattered property and fields far from farm
High net returns	Horse days	available	545	4 760	5 439	2 640	5 545	1 401	5 174	2 106	1 793	5 093	4 061	4 652
		used	401	2 477	2 997	1 679	3 160	946	2 791	1 339	1 179	2 966	2 314	2 977
	Ox days	available	0	533	800	274	640	1 372	457	593	946	355	0	0
		used	0	158	238	103	190	414	136	224	355	165	0	0
	Cow days	available (1)	2 130	0	0	637	152	856	108	976	961	84	249	0
		used (1)	2 130	0	0	637	152	856	108	976	961	84	249	0
Low net returns	Horse days	available	1 772	3 581	5 605	2 558	4 751	3 356	3 546	3 191	2 506	2 517	1 579	2 928
		used	742	1 724	2 975	1 164	1 985	1 472	1 360	1 143	1 596	1 332	799	1 240
	Ox days	available	1 797	0	0	1 409	531	1 175	442	2 097	0	1 839	1 908	243
		used	854	0	0	661	359	545	299	997	0	883	785	83
	Cow days	available (1)	1 859	2	0	782	886	0	1 364	909	750	492	922	640
		used (1)	1 859	2	0	782	886	0	1 364	909	750	492	922	640

(1) As the cows' keep is not to be debited to the labour account except when the cows actually work, the available cow days have been put equal in number to those effectively utilized.

because the good climatic conditions and the fertile plain land lead to a intensification of farming. It is a mistake to make much use of cow as draught animals in intensive farms and it reduces the net returns. Near the same results are obtained by grouping the farms according to t intensity of the hoed crops.

It follows that the horse may be considered as the draught anim *par excellence* for intensive farms. On the other hand well manag farms under extensive cultivation show a remarkably small use of t horse and a notable preference for the work of cattle, both oxen and cow and it is especially in farms with not much land under hoed crops that t work of cows is prevalent. Errors of organization in this case are t prevailing use of horses, which are insufficiently utilized, and the negle of cows, which are the most suitable draught animals for extensive farmin

Farms near the markets can utilize cattle to a greater extent tha those situated further off, notwithstanding the constant tendency towar the intensification of culture, and without diminishing their net return they are even forced to do so in order to utilize regularly their draug animals. Indeed the necessity of a good deal of carriage is a factor of equal distribution of animal labour, inasmuch as this transport wo may generally be performed at the times in which work is slack on t farm. This explains the great amount of horse labour in farms at a di tance from markets and yet yielding considerable incomes.

It is the same with the distance between the fields and between the and the farm. A very small distance or none at all favours the intens fication of culture and leads to the prevalent work of horses, complet by that of oxen and cows, with a view to equalizing the distribution of t work. The use of horses becomes still more prevalent in those farms which the fields are wide apart and distant from the farm itself. Th group of farms is the only one which still gives high returns while using on horses as draught animals ; this is explained by the time saved by the qui pace of the horses in covering the above distances. In these conditions t use of cows would be an error.

From what has been said it appears manifestly that in organizing t work of the animals of a farm the capability and the characters of the di ferent draught animals employed are the basis on which they are to be chose It is only by combining and completing reciprocally the work of the vario animals in harmony with local conditions that it can best be utilized wi the object of keeping the cost of production low and of obtaining high n returns.

The writer demonstrates the truth of the above by means of diagra containing for the previously mentioned 61 farms, divided into t groups according to the amounts of net returns, the curves of the hor ox and cow days, per week and per 100 acres of area of cultivated la These curves are compared with each other and with the line represent the annual average of the work days, expressed in horse-days per we in the farms yielding high net returns.

Investigations into the Profitableness of Fen Cultivation. — FRECKMANN, W., and SABOTTA, in *Landwirtschaftliche Jahrbücher*, Vol. XLVI, Part 2, pp. 275-326. Berlin, 1914.

The writers endeavour to solve the problem of the profitableness of cultivation on the basis of the experience collected during ten s of work at the Neu Hammerstein Moor Experiment Station, with help of the data contained in the literature on the subject. In the place they try to determine the capital that is necessary for such rtakings and then they discuss the ratio between the purchase price e bare fen and the capital required for improvements. They estimate capital for buildings for all kinds of farming at the average figure of er cent. of the total value of the land.

In the calculation of the profitableness of the regularly installed fen , there is no question of ascertaining the amount of expense for each of the original acreage, but of determining the extent of utilisable s after the improvements have been carried out, as well as the cost of hase and improvement of the unit of productive surface of fen in order now the interest that it bears. Draining by means of open ditches ns a considerable loss of area. The writers calculate the amount of loss, and the capital represented by the Neu-Hammerstein fen farm, llows:

Unsanded meadows.

	£	s	d
A) *Drainage by open ditches:*			
1. Preparatory work per acre	1	19	8
2. Drainage by open ditches	1	6	9
3. Work on the slopes and sowing		6	4
4. For the main drainage canal		3	2
5. For roads		1	11
Total per acre of original area	£3	17	10
For one acre of cultivable surface the cost of cultivating is as follows:			
1. Preparatory work, draining, main drain, and roads per acre of cultivable land, with a loss of 2.25 per cent. or $\frac{£3.17.0}{0.9775}$	3	19	9
2. Ploughing (8 inches) including hoeing	1	11	9
3. Disk-harrowing		19	0
4. Manuring:			
a) 6.37 cwt. kainit, 4.78 cwt. basic slag, including haulage	1	1	1
b) Mixing, carting and spreading		2	4
5. Sowing:			
a) Rolling		1	2
b) 9 ½ lb. clover and grass seeds	1	7	11
c) Sowing			9
d) Rolling with light roller		1	2
Total	£9	4	11
Purchase value £11 18s per acre of bare fen: cost of cultivable area $\frac{£11\ 18s}{0.9775}$	12	3	6
Cost of buildings per acre	7	18	9
Total cost per acre of cultivable area	£29	7	4

B) *Drainage by fascines:*	
1. Preliminary work	1 19 8
2. Drainage by fascines	2 7 8
3. Main drainage canal	3 2
4. Roads	1 11
Total per acre	£4 12 5
5. Ploughing and hoeing	1 11 9
6. Disk-harrowing	19 0
7. Manures, carting and spreading	1 3 6
8. Sowing	1 11 1
Total	£9 17 9
Purchase value	11 18 0
Buildings	7 18 9
Total	£29 14 6

In this way the writers calculate the cost of purchase and improvem per unit of area of the meadows and arable land and come to the follow results (Table I).

In preparing sanded fen cultivation it is generally much more adv tageous to bring the sand from outside rather than to excavate it from subsoil of the fen, because a layer of 5 inches taken from the subsoil wo cause an average loss of area of 20 per cent.; the consequent incre of the cost of installation per acre of cultivable surface would equal cost of getting the sand from a distance of 2 660 yards, so that up to distance this means must be preferred. There is the further reason t the subsoil sand is often exceedingly fine and harmful.

An argument in favour of underground drainage is that it avoids l of surface. Unless special technical reasons, such as the depth and spec nature of the fen, or the constitution of the subsoil, or the impossibil of obtaining pipes or fascines at reasonable prices and of conveying th to the fen (often lacking in roads), oblige the open drain to be resor to, this form of drainage should be avoided.

Besides the financial reasons it must also be borne in mind that op drains in winter do not carry off a sufficient quantity of water, and furt that the vegetation on the edges and slopes of the ditches affords protect to animals and plants injurious to crops.

In establishing the cost of producing the several crops the writ include in the general farm expenses: the interest on the instruments production (live and dead stock and stores), all expenses for manageme and supervision, for bookkeeping taxes, dues, repairs of buildings and roa wear and tear of buildings and plant, etc. For the individual crops following percentage of the gross yield is considered as general expens for meadows 12 per cent., for pastures 10 per cent., and for field crops per cent.

In the calculation of the crop returns the writers use figures that somewhat below the real average yields at Neu Hammerstein, as in Tabl

Description of system of cultivation	Value of improvement	Purchase price of land	Value of buildings	Capital (2 + 3)	Total value (1 + 2 + 3)	Share of cost of improvement in % of total value	Ratio of purchase price of land to value of improvement
	£ s d	£ s d	£ s d	£ s d	£ s d		
Unsanded meadows, ditch drainage . . .	9 5 1	12 3 6	7 18 9	20 2 3	29 7 4	31.52	100 : 76.02
Unsanded meadows, fascine drainage . . .	9 17 9	11 18 0	7 18 9	19 6 9	29 14 6	33.27	100 : 83.10
Unsanded meadows, pipe drainage	16 16 9	7 18 9	7 18 9	15 17 6	32 14 1	51.47	100 : 212.18
Sanded meadows, pipe drainage	22 7 9	7 18 9	7 18 9	15 17 6	38 5 2	58.52	100 : 282.16
Sanded arable land, ditch drainage. . . .	29 9 1	9 0 4	7 18 9	16 19 1	46 8 2	63.47	100 : 326.64
Sanded arable land, pipe drainage . . .	27 11 1	7 18 9	7 18 9	15 17 6	43 8 6	63.45	100 : 347.25
Unsanded arable land, ditch drainage . . .	10 19 4	8 14 5	7 18 9	16 13 2	27 12 6	39.70	100 : 125.76
Unsanded arable land, pipe drainage . . .	9 1 9	7 18 9	7 18 9	15 17 6	24 19 3	36.42	100 : 114.57

TABLE II. — *Yields of arable crops (lbs. per acre).*

	Sanded land				Unsanded la
	Actual averages		Figures used in calculations		
	Grain	Straw	Grain	Straw	Grain
Winter wheat	3 200	6 900	2 850	4 100	1 750
Rye	3 000	5 200	2 300	5 200	2 600
Oats	3 350	4 100	2 500	3 750	Spring rye
Barley	2 600	3 350	1 950	3 000	—
Horse beans	3 050	7 500	2 300	3 500	1 875
Potatoes	28 850	—	17 800	—	16 000
Mangolds	60 250	—	53 500	—	53 500
Carrots	43 200	—	44 500	—	—
Mixed grain and pulse	—	—	—	—	1 875
Rape and colza	—	—	—	—	1 425

On account of the high risk in fen farming of damage from frost pests, deductions are made in the crop accounts, as shown in Table

TABLE III. — *Deductions for risk (% of gross yield).*

	Sanded crops		Unsanded c
	Open drains	Pipe drains	Open drai
Winter rye	8	6	20
Spring rye	—	—	15
Oats	10	8	—
Wheat	20	16	—
Barley	24	20	—
Beans	12	10	20
Potatoes	10	10	15
Carrots	12	12	—
Mangolds	12	12	20
Pulse	—	—	22
Rape	—	—	30

On the above mentioned lines the accounts are kept and their d results are collected in Table IV.

Crop	1 Total cost of farming	2 Value of actual gross returns	3 Returns after deduction of risk	4 Net returns (3—1)	5 Capital in land	6 Interest on capital in land at 4 %	7 Capital in improvements	8 9 Interest on capital in improvements: in £ s d (4—6)	in %	10 11 Capital value: According to net returns capitalised at %	£ s d per acre
	£ s d per acre										
1) Meadows with open ditches	3 16 3	5 11 1	5 11 1	1 14 10	20 2 3	16 1	9 5 1	18 9	10.15	5	34 17 6
2) Meadows without sand	3 0 2	5 19 9	5 19 2	2 19 8	15 17 6	12 9	16 16 9	2 6 11	13.95	6	49 14 3
3) Sanded meadows	2 17 1	6 14 1	6 14 1	3 17 0	15 17 6	12 9	22 7 9	3 4 4	14.36	6	64 3 5
4) Sanded field crops										6	68 11 2
a. Rye — open ditches	5 2 2	10 3 1	9 6 10	4 4 9	16 19 0	13 6	29 9 1	3 11 2	12.08	—	—
a. Rye — pipe drains	5 4 2	10 3 1	9 11 11	4 7 3	15 17 6	12 9	27 11 1	3 17 7	14.10	—	—
b. Oats — open ditches	5 0 6	11 19 11	10 15 11	5 15 4	16 19 0	13 6	29 9 1	5 1 11	17.30	—	—
b. Oats — pipe drains	5 2 6	11 19 11	11 0 9	5 18 3	15 17 6	12 9	27 11 1	5 5 6	19.16	—	—
c. Wheat — open ditches	5 9 6	15 15 9	12 12 7	7 3 1	16 19 0	13 6	29 9 1	6 9 6	21.99	—	—
c. Wheat — pipe drains	5 11 6	15 15 9	13 5 3	7 13 9	15 17 6	12 9	27 11 1	7 1 0	25.60	—	—
d. Barley — open ditches	5 1 3	9 9 6	7 4 0	2 2 9	16 19 0	13 6	29 9 1	1 9 2	4.95	—	—
d. Barley — pipe drains	5 3 3	9 9 6	7 11 5	2 8 3	15 17 6	12 9	27 11 1	1 15 7	6.46	—	—
e. Horse beans — open ditches	5 8 5	9 9 11	8 15 11	3 7 6	16 19 0	13 6	29 9 1	2 13 11	9.16	—	—
e. Horse beans — pipe drains	5 10 5	9 9 11	8 19 11	3 9 6	15 17 6	12 9	27 11 1	2 16 10	10.32	—	—
f. Potatoes (open ditches)	8 1 6	11 18 0	10 14 3	2 12 9	16 19 0	13 6	29 9 1	1 19 3	6.66	—	—
g. Mangolds (open ditches)	6 6 11	14 5 8	10 9 6	4 2 6	16 19 0	13 6	29 9 1	3 9 0	11.71	—	—
h. Carrots (open ditches)	6 19 8	17 17 0	15 14 3	8 14 7	16 19 9	13 6	29 9 1	8 1 0	27.33	—	—
5) Unsanded field crops										5	21 18 7
a. Winter rye	5 5 0	8 0 3	6 8 3	1 3 3	16 13 1	13 3	10 19 4	9 11	4.51	—	—
b. Horse beans	5 8 5	8 2 11	6 10 3	1 1 11	16 13 1	13 3	10 19 4	8 7	3.94	—	—
c. Potatoes	8 1 6	10 14 3	9 2 1	1 0 7	16 13 1	13 3	10 19 4	7 3	3.33	—	—

The results show that a fen farm when suitably drained and manag is profitable from the point of view of both private and public econon

On the distribution of the area devoted to the different crops the g eral economic and market conditions have a great influence. Field cr always require a sufficient amount of labour for the suitable tilling of fen soil.

The cultivation of unsanded fens is to be practised only when excessive distance from the mineral soil does not allow the dressing to applied at a reasonable cost.

Underground drainage by means of pipes or fascines is under circumstances to be preferred to open ditches for permanent pastures a field crops and this all the more the higher the purchase price of the bare s

For sanded fen soils, wheat, rye, oats, barley, potatoes, beets, gras beans, rape and colza are to be considered as sure crops. Other pul as well as serradella and mixtures of pulse and cereals (with the excepti of lupins) are not to be quite neglected, but they are less advantageo Sugar beets are to be grown according to the results of local trial in ea individual case. Clover can only be considered in connection with gr leys.

For unsanded fen land the most suitable crops are rye, mixtures wheat and pulse, beans, potatoes, and Swedes; next come rape and colz oats and barley must be considered as doubtful. Wheat and beets in general to be avoided, and they can at most be considered on l that have been warped.

The injury to fen crops by frost and pests must also be carefully exa ined with a view to finding the most suitable means of protection. Th is, however, a certain compensation between the drawbacks of farmi on fens, such as severe winter or spring frosts, various pests and the abun ance of weeds, and the fact that fens are better ensured against the con quences of continued drought than the best deep higher soils.

In the droughty year 1911 the valuable loess soils gave miserab yields of hoed crops, clover and spring cereals, while the crops in the f were not much inferior to the average. At Neu Hammerstein they yield as follows:

	Lbs. per acre	
Winter rye	3 200 grain	6 000 straw
Horse beans	2 750 »	7 300 »
Oats	3 900 »	5 600 »
Potatoes	40 900	
Mangolds	50 700	
Carrots	83 750	
Meadows	8 000	
Pastures	430 increase of live weight.	

The Cost of Establishing an Orchard. — EVANS, L. A. — *The Cultivation of the Apple in Tasmania.* Hobart, 1914.

The following are the data on the cost of establishing two apple orchards, one 25 acres in extent and the other 100.

Twenty-five acre orchard.

	£
Twenty-five acres at £20 per acre (ready for the plough)	500
Fencing, packing-shed and cottage	350
Five thousand trees at 70s per 100	175
Planting 25 acres	15
Five years' cultivation, pruning, etc., at £4.10s per acre	560
Interest on outlay for five years at 5 per cent. compound interest.	370
Unforeseen expenses	30
Total	£2000

The returns from the fifth to the seventh year may fairly be calculated to pay the orchard expenses. From the tenth year onward the annual return from the orchard should be at least 6 000 bushels. These, at the moderate estimate of 2*s* 6*d* per bushel on the trees, give £750; deduct £325 for working (calculating at £9 per acre), leaving £525, from which annual interest on £2000 has also to be deducted. Thus there would be a clear income of £425. It must not be forgotten that a *bona fide* settler gives his own work and would thus save £80 a year; in addition to which he has £2000 capital he would get the interest on the amount invested, namely an average of £74 per year, giving him £154 to live upon until the orchard came into bearing; further that the price of 2*s* 6*d* per bushel on the tree is a moderate price and that by careful attention to packing and sound judgment in marketing higher prices can be realized.

The following estimate deals with a 100-acre orchard:

Estimate of cost of 100 *acres of land cleared and planted with apples.*

	£
First cost of 100 acres of land, at £5 per acre	500
Grubbing, etc., and clearing land to make it fit for ploughing, at £6 per acre	600
Cost of ploughing and subsoiling	100
Two-year-old apple trees at £3 per 100, planting 100 per acre	300
Cost of planting	100
Purchase of four farm horses	100
Implements and tools	300
Fencing with wire netting	80
Draining	100
Cost of buildings for manager, workmen, stables, etc.	780
Manuring young trees, artificials	450
Horse feed and cost of keeping horses for one year £100, labour and management £824 per year for five years	4620
Total cost of 100 acres of orchard at the end of five years containing 7-year-old trees	£8000

AGRICULTURAL INDUSTRIES.

850 – **Refrigeration and Aeration of New Wines as a Means of Hast their Maturity.** — KLOSS, J., and SCHNEIDER, F., in *Allgemeine Weinzeitung*, 31, No. 28, pp. 313-315. Vienna, July 9, 1914.

The writers carried out at the zymo-chemical laboratory of the Col of vine and fruit growing at Klosterneuburg (Austria) several experim on new white and red wines in order to study the effect of refrigerat followed by intense aeration on the maturing process. The wines bottles and in casks, were kept during 24 to 48 hours at temperature 28.4 to 26.6° F. (at which temperatures they did not freeze), after wh they were aerated (by passing air through them for 24 hours or rack them off and allowing them to fall in a shower through air) and then sto in a cool cellar for a fortnight. They were then filtered and examin The wine used as control was not refrigerated, but otherwise it was trea in the same way.

The results were as follows: In red wines no effect of refrigerat could be determined. In white wines, on the contrary, the colour darker than in the control wine and the taste and fragrance had decide more of the character of old and ripe wines. Chemical analysis shows marked decrease in the content of nitrogenous matter; such a decr is produced only by keeping wine a long time in cellarage and rack it repeatedly. The processes of oxidation, which cause certain constitu of wine (especially those containing nitrogen) to become insoluble and c sequently to precipitate, take place much more rapidly in refrigera wines.

Another benefit derived from refrigeration and aerating was see that the wines so treated and then filtered kept perfectly clear, whereas control wines very soon became turbid, which change is connected with nitrogenous matter still contained in the wine.

851 – **Development and Present Situation of Milk Recording and Book-kee Associations in Denmark.** — *Prepared from a communication from* A. C. Dea *Adviser, Rudköbing, Denmark.*

According to a communication from the Danish Statistical Bur there were in 1909, 519 Record Associations in receipt of subventions fr the State. Of this number 128 had been founded between 1895 and 19 207 between 1900 and 1904 and 184 between 1905 and 1909.

In 1909, 12 572 farmers possessing 224 837 cows were members record associations, while 167 235 farmers with 1 047 316 did not bel to any association, and 2 566 farmers with 9 821 cows had not sent any answer to the enquiry.

The following figures for the year 1909 show the connection betw the size of the farms, the number of animals and milk recording:

Size of farm	Percentage of farms in which milk records are carried out	Percentage of cows under record out of total of country
up to 1.36 acres	0.3	0.5
om 1.36 to 12.26 »	1.1	1.4
» 12.26 » 36.80 »	3.3	4.7
» 38 80 » 73.60 »	11.2	14.8
» 73.60 » 147.20 »	18.9	24.5
» 147.20 » 588.82 »	21.1	34.4
bove 588.82 »	38.8	46.3
On the whole . .	7.2	18.0

t is thus evident that it is mostly the larger farms that submit their to milk recording.

Many of the larger farms carry out milk recording by themselves and are not included in the above figures.

The number of milk recording associations has been almost stationary 1909; this is due to the fact that the greater part of farmers inte- l in cattle breeding, in so far as conditions allow, belong already to associations.

In northern and western Jutland there are only a few record asso- ns, as there fattening is prevalent. On the islands and in south- n Jutland about a quarter of the number of cows are under record, nen a third.

By the union of the associations into federations a certain uniformity thod is attained. Milk recording has already exerted some influence eeding. At cattle shows only bulls which can show controlled per- nce records of their dams, grandams, etc., are exhibited. In n fairly high performances of the dams have been required as the t limits for admission to the shows.

The law of June 8, 1912, provides a yearly state subvention of o for these associations, each of which gets £11 on condition of con- ng to certain regulations.

A record association has usually from 15 to 25 members with about cows. The control work is carried out about every 20 days. The y cost per cow amounts to from 1s $5^3/_4d$ to 1s $10\frac{1}{2}d$ per cow and ut the State grant to 2s 2*d*; in these sums the board and lodging by the members to the control assistant are not reckoned.

Of late years the tendency is towards entrusting the control assistants nly with the accounts immediately connected with the milk records lso with the whole book-keeping of the farm. Thus the record iations gradually become book-keeping associations. The beginnings ese associations were fairly simple but not uniform. In the year such a book-keeping association was founded at Langeland and it been followed by others. The work of milk recording goes on in them sual, only as the book-keeping associations are smaller, the records

can be made oftener, which is all to the advantage of the greater trus worthiness of the results. Tha farm accounts at the same time suppl a certain check on the performance records. The number of members i as a rule, from 15 to 18; they farm from 1 200 to 2 000 acres and own 2 to 300 head of cattle.

The cost of the book-keeping is reckoned on the basis of the acreag of the farm, while the cost of milk-recording is based on the number of hea of cattle, as in the other record associations. A farm of 61 acres pay for its book-keeping from 22 to 33s a year. The farmers enter in specially prepared books and a cash book the several transactions according t the system of simple entry. When the record association assistant visi the farm, for the first time in every month, he posts the farmer's entrie in the regular account books kept on the double entry system. This ha the advantage that any error can be rectified at once *viva voce* and on th spot. According to the wish of each member the books are kept wit a greater or lesser number of accounts. In general the farmers desi to know the returns of the various crops and the profitableness of th different branches of their farms.

852 – **Preserving Milk Samples for Examination.** — TILLMANNS, F., SPITTGERBER, J and RIFFART, H., in *Zeitschrift für Untersuchung der Nahrungs- und Genussmi sowie der Gebrauchs-Gegenstände*, Vol. 27, Part 12, pp. 893-901. Münster i. W June 15, 1914.

According to the writer's experiments the requirements of an ide means of preservation are: 1) It must preserve the degree of acidity of th milk for at least 72 hours. 2) It must not bring about any change in th behaviour of the milk to alcohol. 3) It must cause no change in the phy sical and chemical composition of the milk. 4) It must not have an action on the nitrates which may be contained in the milk and especially *a*) it must preserve the nitric acid from decomposition, *b*) it must have n action on diphenylamine, neither weakening nor reinforcing its effec

In view of these requirements the experiments made by the write in their research for the most suitable substance, led to the discardin of a number of substances commonly used. They tried chloroform, thy mol, oil of mustard, phenol, creosote, sodium fluoride, mercuric chlorid and potassium bichromate. The latter substance reacts strongly on d phenylamine and should have been discarded, but it was tested owing t its current use.

The examination of the above-named substances led to the followin results:

Thymol, phenol, creosote and sodium fluoride cause the milk to coagu late after 24 to 48 hours. Bichromate of potash, owing to the intens yellow colour it gives to milk, does not allow an accurate determinatio of the degree of acidity to be carried out. Chloroform causes an increas of refraction and of fat content. Creosote causes a decrease of specif gravity. Thymol and creosote enfeeble the diphenylamine reaction t a considerable extent. This is also the case in a small degree with oil o mustard and phenol. Bichromate of potash causes milk to give a strong

tive reaction with diphenylamine, even without the addition of a nitrate. ıll the means of preserving milk only chloride of mercury answers to above-mentioned requirements. When used in a 0.04 to 0.03 per solution it preserves milk quite fresh for 120 hours without any notice-increase of acidity.

Further it has no action whatever upon the milk constants and allows quantitative determination of nitrates to be carried out even after hours. The use of chloride of mercury for official milk control is, ever, owing to its poisonous nature, only admissible with certain autions. Thus to allow it to be easily recognized the writers add go red to the sublimate. This colouring matter, used at the rate of c. of a 2 per cent. solution in water in 250 cc. of milk, has no effect ll upon the resu'ts of the analysis of the latter.

PLANT DISEASES

GENERAL INFORMATION.

853 – **Decree of the President of the French Republic, June 9, 1914, Authorizing the Introduction into France of Plants other than Vines through the Dijon Customs House.** — *Journal officiel de la République française*, Year 44, No. 18 p. 5389. Paris, June 20, 1914.

Art. 1. — Trees, shrubs and all plants other than vines coming from foreign nurseries, gardens, hot-houses and orangeries may be introduced into France through the Dijon Customs House under the conditions set forth in articles 2 and 3 of the decree of August 28, 1882.

Nevertheless, the certificate of the competent authorities of the country of origin will not be required when the plants come from an establishment entered in the lists published according to article 9, paragraph 6, of the International Phylloxera Convention.

Art. 2. — The Ministers of Agriculture and of Finance are charged in their respective spheres, with the carrying out of the present decree.

854 – **Order of the French Minister for the Colonies, June 19, 1914, forbidding the Importation of Hevea Plants into Indo-China.** — *Journal officiel de la République française*, Year 46, No. 170, p. 5488. Paris, June 24, 1914.

Art. 1. — The importation into Indo-China of hevea plants is forbidden; the introduction into the Colony of hevea seeds is allowed and is not subject to any disinfection.

Art. 2. — The Governor-general of Indo-China is charged with the execution of the present order.

855 – **Order of the French Minister for the Colonies, June 19, 1914, Establishing Regulations Concerning Disease in Coconut Plantations in Cochin-China and in the Annam and Cambodia Protectorates.** — *Journal officiel de la République française*, Year 46, No. 171, pp. 5534-5535. Paris, June 25, 1914.

Art. 1. — A regulation concerning disease in coconut plantations has been established on the following bases in the Colony of Cochin-China and in the Annam and Cambodia Protectorates.

Art. 2. — Any person, owner, manager, farmer or holder in any of coconut plantations which have been attacked by the Coleoptera n as elephant beetle or black beetle (*Oryctes rhinoceros* L. ; in Annamese erfect insect is called " con kien vuong " and its larva " con sung ") ose known as coconut weevil (*Rhynchophorus ferrugineus* Oliv. ; namese the perfect insect is called " con bu xe ", its larva " con ") or by any other insect or in general by any disease of whatever e, must immediately declare it to the nearest native or French au- ies, who will without delay forward such declaration to the Chief nistrator of the Province, who, after having ordered a technical ination of the plantation, will order one of the following measures.

Art. 3. — If the trees are only slightly attacked by the elephant , that is to say if only 5 or 6 holes bored by the insect have been , the owner or other person in charge must have the holes stopped a composition containing pitch, coal-tar or similar compounds, and destroy throughout the property all the sources of infection as defined 5 ; he must also carry out such other measures as may be ordered e authorities, in particular those which will be set forth in the special ictions published by the Administration.

Art. 4. — If the trees are either dead, badly attacked by the elephant , or simply attacked by the weevil, they must be uprooted and either ly destroyed by fire or completely immersed in water so that the larvae, pupae or perfect insects be destroyed and that the débris not became a breeding place or a refuge for new parasites.

Art. 5. — Any person possessing lands at a distance of less than . (1 ¼ mile) from a coconut plantation (that is an area planted with 40 coconut palms per acre) is bound to destroy on the land belong- him, the palms or other plants attacked by the elephant beetle or eevil, to remove or destroy the dead plants, trunks or debris of coco- nees, and the heaps of manure or any other decomposing organic r in which the presence of larvae of beetles has been detected or may become sources of infection.

Art. 6. — The Chief Administrators of the provinces and their assis- , the Agents of the Agricultural and Commercial and Forest Services, y officials appointed by the Government, are to have free access to coconut plantations, whatever their extent, in order to ensure the ob- nce of the present Order. They can draw up reports which will be usive in default of proof to the contrary.

Art. 7. — Any person refusing or neglecting to comply with the ictions contained in the above articles 1, 2 and 3 is subject to the ties set forth in articles 479 and 482 of the Penal Code.

Art. 8. — The same judgment inflicting the above penalties may, e cases contemplated by articles 4 and 6, order the destruction of the or sources of infection by the village and at the expense of the offender. is an European or a person considered as such, this destruction will ried out in the same way but under the supervision of a police officer.

Art. 9. — The Governor-general of Indo-China is charged with execution of the present Order.

856 – Italian Royal Decree of May 3, 1914 (No. 425), Instituting an Independent Phytopathological Observatory at Turin. — *Gazzetta Ufficiale del d'Italia*, Year 1914, No. 136, pp. 3056-3057 Rome, June 10, 1914.

Art. 1. — An independent Phytopathological Observatory is for at Turin on the initiative of the Agricultural Association (Comizio Agr of Turin ; the expenses are defrayed by the Commune, the Savings B the Chamber of Commerce, the Charitable Foundation of St. Paul, Grand Masters of the Orders of Saints Maurice and Lazarus and of Crown of Italy, and the Agricultural Association, with assistance f the State.

Art. 2. — The objects of the observatory are : *a*) to follow care any condition of disease in cultivated plants and to study its causes remedies ; *b*) to spread among farmers, by means of meetings, talks practical lessons to be given in various localities, a precise knowledg the diseases of plants and of the best means of controlling them ; *c*) to s with the cooperation of farmers, experiment fields for the protectio plants against the most widely spread diseases ; *d*) to watch over the p gardens and avenues of the city of Turin from the point of view of p diseases and at the request of the Municipality, and if necessary to a in the application of suitable means of control ; *e*) to examine dou mushrooms and other fungi at the request of the Bureau of Hygi *f*) to give verbal or written consultations to the farmers of the dist *g*) to attend to the institution of a special Museum of Plant Pathol *h*) to examine the seeds of cultivated plants as to purity and germinat *i*) to undertake the services of vigilance, warning, prevention and cu the diseases of plants in Piedmont.

Art. 3. — The observatory is managed by a Board of Admini tion composed of representatives nominated one each by the Min of Agriculture, the Turin Savings Bank, the Turin Agricultural Ass tion, the Municipality of Turin, the Chamber of Commerce and Indust Turin, the Charitable Foundation of St. Paul, the Grand Master of the O of St. Maurice, and those bodies or private persons who contribute an subscriptions of not less than £ 20. The members of the Board their seats for three years and may be re-elected. The Board elects f among its members a president, also for three years and eligible for re tion. The director of the observatory is a member of the Board and as secretary.

Art. 4. — The Director is at the head of the scientific activity the Institute ; he must present every year to the Board of Administra a report, upon the work done in the course of the year, the programm the experiments to be carried out in the following year, the estimat the expenses and the balance sheet of the preceding year, audited by accountant who is elected every three years by the Board and who assist at the Board meetings as advisory member. Every year a copy

of these documents will be sent to the Ministry of Agriculture, Industry and Commerce.

Art. 5. — Besides the Director, the staff of the Observatory includes Assistant Director and a Curator-Secretary. The Assistant Director the supervision of the Laboratory and, when necessary, replaces the ctor. The Curator-Secretary is entrusted with the books, correspond-, library and collections, and if he has a degree he may substitute the stant-Director. If the budget allows, a second Assistant may be ged according to the decision of the Board of Administration. The ident, after consulting the Director, may nominate one or two special nteer or honorary unpaid Assistants, who will have the right to fre- it the Observatory and to make use of the scientific material according les laid down by the Director.

Art. 6. — The Director is nominated according to the results of a petition organized by the Board of Administration and his nomination l be approved by the Ministry of Agriculture. The rest of the staff minated by the Board of Administration on the proposal of the Di-

Art. 7. — The funds of the Observatory are provided as follows: State contributes £80 under chap. 66 of the Budget of the Ministry griculture, Industry and Commerce for the year 1913-14, and in the sponding chapters for the succeeding years; the Municipality of n £ 20; the Turin Savings Bank £ 80; the Chamber of Commerce of n £ 20; the Grand Master of the Order of Saint Maurice £ 20; the itable Foundation of St. Paul £20; the Agricultural Association of Turin The Commune, besides its pecuniary assistance, provides housing, , gas, stationery and plant other than scientific (furniture, etc.). The try of Agriculture will also, in virtue of the Law of June 26, 1913 868), which deals with measures for the prevention and cure of the es of plants (1), furnish special funds for the services of vigilance, ing, prevention and treatment of diseases of plants in Piedmont.

Art. 8. — The advice given to farmers is free of charge. The Board ministration may however establish a tariff for the reports and other demanded by the public.

Art. 9. — Other local institutions may give their adhesion to the t Statute, lending their aid to the Observatory and securing repre- ion on the Board by agreement with the founders and with the appro- the Ministry of Agriculture, Industry and Commerce.

Art. 10. — Special regulations proposed by the Board and approved e Ministry of Agriculture will regulate the working of the Observatory.

Temporary provision.

Art. 11. — The present staff (Director and Assistant Director) of District Observatory (2) will continue its work in the Independent pathological Observatory.

(1) See No. 995, *B.* Aug. 1913.
(2) See No. 278, *B.* Jan. 1911 and pp. 1000-1005, *B.* July 1913. (*Ed.*)

BACTERIAL AND FUNGOID DISEASES.

857 – **The Conditions determining the Outbreak of Vine Mildew in Hungar**
— *Communicated by Dr.* GY. VON ISTVANFFI, *Professor at the University and D*
of the Royal Hungarian Central Ampelological Institute, Budapest.

The Royal Hungarian Central Ampelological Institute of Buda has now published (in Magyar) the fifth volume of its works ; this cont the studies made by Dr. F. SÁVOLY under the direction of Dr. GY. ISTVANFFI. An abstract has also been published in French, as Vol. the *Annals* of the Institute ; this was prepared on the occasion of the ternational Congress of Viticulture held at Lyons from July 20 to 22, 1

The most important results of Dr. Sávoly's work may be summar as follows :

I. — The climatic conditions required by mildew cannot be de mined except by carrying on researches for several years on an exten and varied territory and by methodically working up the data thus tained.

II. — Only study of the weather before the first appearance mildew can lead to satisfactory results. It is sufficient to consider temperature and the quantity and frequence of the rain. As unit territory, the district (" járás") has been taken. The dates of the appearance of the disease were noted on a map and the parts in whic appeared simultaneously were joined up by lines. The curves so obtai are called " isophanes " and the areas enclosed between them " isoph belts ". Starting from the first appearance of mildew and proceeding the relatively late appearances, we distinguish a series of isophanic b each member of which corresponds to a period 1.55 times as long as preceding one.

III. — Comparing the data obtained from 1910 to 1912 the foll ing observations can be made : 1) The earliest appearance of mildew Hungary was on May 21. 2) In general most of the dates of appeara were between June 5 and 15, that is to say during the flowering-perio the vines. 3) The date of the infection which causes this general outbr of the disease must be sought in the last ten days of May.

IV. — The comparison of the mildew maps of the last four y gives the following results : 1) The first appearance of mildew occurs the same locality every year, and its spread almost always follows the s main routes. 2) This characteristic constancy does not depend so m upon the weather as upon orographic causes and those connected with nature of the soil. 3) In its spread mildew does not make jumps, but proce gradually from one locality to another; starting from the point at wh it first appeared, numerous transition points are found towards the sp in which it appeared later. 4) The speed at which mildew spreads is not

(1) See also No. 68, *B.* Jan. 1913; No. 1208, *B.* Oct. 1913 ; and No. 529, *B.* June 19

in all directions, but the speed in the several directions seems to be ant every year.

V. — The features more or less common to these four years are visible on the map representing the appearance of mildew in its general es. It is seen also: 1) That in general mildew starts from a triangular the vertices of which lie near Kaposvár, Villany and Kecskemét. at the disease advances for a certain time approximately in the ions marked by the angles of this triangle. 3) Independently of first area, and one or two isophanes later, secondary centres of ion are observed, especially in the Kis-Alföld (Small Hungarnia), then near Versec and on the sands of Hajdu and Szabolcs counties. ast-named is the most important, as it is the point of departure independent invasion.

VI. — Mildew generally makes its appearance in the following : first in the country to the north of the Mecsek mountain, between emét and Lake Balaton, and in the valley of the Danube towards es; a little later on the plain in the angle between the Danube and rava and the northern part of the sandy land in Pest county; next the country about Versec and Fehértemplom and the sandy region ajdu and Szabolcs counties, which are separated from the central f the Great Plain by a belt in which the disease appears late. After two sandy regions comes the Kis-Alföld.

VII. — Mildew appears relatively late on the alluvial soils of ft bank of the Tisza, and along the Bodrog and the Maros and especia the parts watered by the three branches of the Körös and the Be), as well as on both banks of the Tisza (in Szolnok and Heves counties) Szolnok as far as Tokaj; the same is the case in Torontál and Temes ies, in the valleys of the Temes and of the Bega, and in the sou parts of Bács county; the orographic and climatic conditions of these ties differ very little from those of the districts in which mildew rs early. This delay is rather due to the lack of great extents of soil and the presence of large areas on which water stands.

VIII. — The disease appears latest, about 60 or 80 days after rst appearance in Hungary, in the western, southern, north-eastern outh-eastern parts of vine-growing Hungary situated at heights above n. (660 ft.) and lastly in the eastern parts (Transylvania).

IX. — It appears from the study of the climatic data that the tempe e of the month of April has a determining influence on the appearance ldew. Provided there is enough moisture in winter and spring, which most always the case, mildew appears the earlier the more regular the f temperature in April. If in the month of April or at least in its d half night frosts have ceased (even though the warmth during the may not be considerable), the appearance of mildew may be expected t the middle of May. But if there are repeated relapses in the rise mperature in April the appearance of mildew will be retarded. This dation will be all the greater the more frequent the relapses have been

and the longer they have lasted. In this case the appearance of m may be retarded to the end of May.

X. — The account of the weather before the first appearan mildew has been kept as follows. A determination was made for locality and then for the whole of the country situated within the isophanes of the amount and frequency of the rainfall and the mean temperatures from April 1. By multiplying these three data by the nu of days after April 1, a figure has been obtained in which the climatic fa appear in proportion to their biological value.

These biological values of the weather seem to show that in ge mildew makes its appearance in a district when the biological value weather reaches the figure that it had in the first isophane of the The great deviations that the biological values of the different years pr may be eliminated by introducing into the calculations a factor conn with the value of the position of the rain. (1) The biological value obtained for 1910 to 1913 is 281 ± 14.

The writers call this figure " Bios ". It expresses the value by the weather calculated according to the above formula, when the teorological conditions for the first appearance of mildew have been real Expressed in a mathematical formula: $-B = c.g\,h.\,k.\,T$, in which Bios, c = the mean rainfall from the first of April to the day of the appearance of mildew, g = the average of its frequency, h = the daily temperatures, k = the influence of the date at which the rain T = the number of days of the period.

The regular decrease noticed in the table of the " Bios " values serve as a kind of forecast. It is assumed that after the first isop there will be no greater irregularities in the weather than in the p between the 1st of April and the first isophane. The deductions are according to the rule of three, using the " Bios " of the first isophane the " Bios " of the isophane in question. A series of numbers in in ratio to the series of decreasing " Bios " values is thus obtained.

Carrying out this calculation for the years 1910 to 1913 the follo numbers of days are obtained:

Isophane	II	III	IV	V	VI	VII
1910	**51**	**55**	**63**	**69**	**83**	**90**
	51	56	63	74	91	117
1911	**47**	**57**	**65**	**73**	**80**	**97**
	47	52	59	70	87	113
1912	**56**	**60**	**63**	**65**	**71**	**86**
	61	66	73	84	101	127
1913	**55**	**66**	**65**	**79**	**80**	**81**
	53	58	65	76	93	119

The figures in heavy type show the date on which mildew was c lated to appear, those in ordinary type the actual date of appear

(1) This refers to the fact that rains of equal amount are more effective when fall nearer to the date of appearance.

l be seen that the two sets of figures show very considerable agree-

he prognostic value of these series is undoubted, but their appli- is limited by the delay of three days necessary in calculating from st isophane.

ut the formula $B = c.g.h.k.T.$ renders one independent of the sophane; it has only to be borne in mind, according to the process bed in the original work and for a great number of localities situated ularly as possible, when the "Bios" attain towards the middle of he value of 281 $\pm$ 14. It is in such localities that the appearance lew may be expected shortly; in this forecast use may advantageously de of the temperature curve of the month of April and of the know- of ecological factors. One of the chief conditions of success of this d is a network of meteorological stations in perfect working order ith telegraphic connection.

XI. — According to these researches the districts in which mildew its first appearance in Hungary are determined by orographic and ic conditions and especially by the nature of the soil and the condi- of superficial hydrography. The weather only influences the date earance. The disease does not appear first in the warmest districts here most rain falls, but in the southern part of the Great Hungarian where there are extensive sandy areas and a number of tracts liable ding. On the other hand the disease appears late, even in the sou- districts, on cold soils, notwithstanding the abundance of superficial and favourable weather. After an April with regular temperature ithout white frosts the first appearance of mildew may be expected the middle of May, and in general when the value of the "Bios" ited from the 1st of April reaches the figure of 281.

Results of Investigations made in Austria in 1913 into the Leaf-curl of tatoes (1). — KÖCK, G., KORNAUTH, K., and BROZ, O., in *Zeitschrift für das dwirtschaftliche Versuchswesen in Oesterreich*, Year XVII, Part 5, pp. 270-300. nna, 1914.

uring 1913 the writers continued in several parts of Austria the ch work which had been commenced on a large scale several years Among other investigations they carried out a whole series of in- n experiments with different species of *Fusarium* on several varieties tatoes by simply surrounding the root crown of the plants with ed soil.

he most important conclusions that have been drawn from these om the preceding investigations are the following:

1). Leaf-curl is a fungoid disease caused by forms of *Fusarium* or *illium*; the former are predominant towards the south (for instance stria-Hungary), the others towards the north (northern Germany).

2). The primary infection (that is that of a plant that till then had

(1) See also No. 580, *B.* June 1914; No. 683, *B.* July 1914. (*Ed.*).

been healthy and had sprung from a healthy plant) is caused by containing the above disease-producing agents.

3). The tubers obtained from a plant attacked by leaf-curl are all necessarily diseased ; some shoots may be quite immune and will nat ally produce sound tubers ; tubers formed on the shoots infected by fungus are in some cases more or less infected by the mycelium of the p site, or when the mycelium remains restricted to the vascular bundle the haulm and the stolon, such tubers appear singularly weakened by injurious action of the mycelium on the movements of the sap.

4). When tubers infected by the mycelium are planted, one of two following circumstances is observed : either the mycelium grows this is rather rare) in the young shoots in course of formation — and result is what the writers call " secondary infection ", with a new app ance of curled leaves, — or (as is the case with tubers not containing myce but weakened) sickly and weak plants are produced but without curl ; the writers give this the name of " Folgekrankheit " (after-d of the disease).

5). Leaf-curl and its after-effects may be spread by tubers produ by shoots which had suffered from primary infection (deriving f the soil).

6). Different varieties of potatoes possess a very different resista to the disease ; it seems as if none were completely immune.

7). For the control of the disease the following measures are commended : *a*) to abstain from growing potatoes for at least five y in those fields in which leaf-curl has appeared ; *b*) to select seed potat with the greatest care, to grow only varieties which have proved suita to the locality and to choose a favourable soil ; *c*) to strengthen the pla by appropriate manuring ; *d*) to pick out carefully and remove from growing crop any infected plants.

859 – A Disease Affecting the Sisal Hemp Plant: *Colletotrichum Ag* Cav. (1). — BANCROFT, C. K., in *The Journal of the Board of Agriculture of B Guiana*, Vol. VII, No. 4, pp. 181-182. Demerara, April 1914.

The leaves of sisal hemp (*Agave rigida* var. *Sisalana*) grown in Bri Guiana have during the past five years been affected by a disease wh renders them useless for the preparation of the fibre, and which is according to laboratory observations, to *Colletotrichum Agaves* Cav.

As far as is at present known the parasite has appeared only on pla grown away from the coast, but the plant has not been cultivated t the coast to any great extent.

The fungus has been grown on artificial media. Inoculations on cut surfaces of leaves (incisions, wounds, etc.) have confirmed the obser tions of Shaw on the reproduction of the disease and on the pathog agent. Attempts to reproduce the disease by placing the fungus on injured surfaces of the leaves have failed, thus again confirming the

(1) See No. 883, *B.* July 1913.

m that the organism is a wound parasite, *i.e.* can only affect the leaf ially at a broken surface.

The "New Disease" or "Dry Disease" of the Sugarcane: *Marasmius sacchari*. — BANCROFT, C. K., in *The Journal of the Board of Agriculture of British uiana*, Vol. VII, No. 4, pp. 183-187. Demerara, April 1914.

The writer describes under the name of "new disease" or "dry se" the disease caused on the sugarcane by the fungus already known r the name of *Marasmius Sacchari*. The disease was first observed itish Guiana at Berbice in 1907; it has subsequently been reported to on many estates in different parts of the Colony. On some of these extended greatly, while on others it does not appear to have progress- pidly and in some few cases it has disappeared after a short time. The writer reports upon the methods employed in combating the se. The varieties which are generally badly affected in this Colony are bon, D 625, B 208 and Green Transparent. The two former suffer than any other varieties. D 109 is also frequently affected; D145) 118 are more resistant, while D 216 and D 159 are not reported to fected.

The planting of the more resistant varieties in badly affected fields period of several years for the purpose of checking the spread of the se is a matter which should receive careful consideration, as well as cing infected stools with plants of more resistant varieties. The t of these methods would be to reduce the fungus in the soil to a num before replanting with the more susceptible varieties.

Two New Species of Fungi in Tobacco Seeds Beds: *Gloeopeziza turricula* and *Hyalopus geophilus*. — SACCARDO, P. A., and PEYRONEL, B., *Bollettino tecnico della coltivazione dei tabacchi, pubblicato per cura del R. Istituto perimentale in Scafati* (*Salerno*), Year XIII, No. 1, pp. 3-6, 1 plate. Scafati, 1911.

The writers received from the Royal Experiment Institute for the vation of Tobacco at Scafati two samples of mould from tobacco eds, attacked by two species of fungi which they consider new to science which they describe under the names of *Gloeopeziza turricula* and *opus geophilus*.

The former is a discomycete characterized chiefly by its ascophores, h are cylindrical or shaped like elongated truncated cones resembling towers (whence the specific name); it is visible as brick-red dots ne mould, and, according to the information collected by the writers, pears generally in January and February on the seedbeds formed of d, which have previously been warmed and are protected by cover- It develops in patches, frequently large, and forms a kind of red that hinders the development of the germinating tobacco seeds and kills them. The species is allied to *G. Rehmii* Zuk. and *G. Zukalii* n, from which it is easily distinguished by certain morphological acters. In another sample of mould received later the writers recog- l *G. turricula* in a very young stage of development; this material ed of preliminary observations on the sexual organs (carpogonia

and antheridia) contained in the young ascophores, which are then co pletely red.

Hyalopus geophilus (Mucedineae) is very minute and completely hy line, so that it is difficult to distinguish it without the help of the mic scope; this fungus develops on the same places as *G. turricula*, over wh it spreads.

These two species do not live on moulds that have been carefu heated to about 100° C. (212° F.) for a couple of hours. Such part sterilization is therefore recommended for the prevention of these fu as well as of parasitic diseases, weeds, etc.

862 - ***Cladochytrium Mauryi* and *C. Ollivieri*, New Phycomycetes on eaves of *Colchicum autumnale* and of *Orchis incarnata* and *O. laxiflora* in France.** — HARIOT, P., in *Comptes rendus hebdomadaires séances de l'Académie des Sciences*, 1914, 1st Half-year, Vol. 158, No. 23, pp. 1765-; Paris, 1914.

The writer describes (with Latin diagnosis) two new species of *dochytrium*. One, *C. Mauryi*, was found in May 1914 on leaves of *chicum autumnale* at Châlons-sur-Marne; it seems to differ from all other species that have been described as parasites of Liliaceae and Iride The other, *C. Ollivieri*, was found in May and June of the same year leaves of *Orchis incarnata* and *O. laxiflora* at Esbly (Seine-et-Mar

C. Ollivieri is very near *C. Mauryi*, but can be distinguished by spots it forms being darker, longer and smoother; its spores also s larger.

Orchis laxiflora appears to be only exceptionally attacked, and spots upon it seem smaller and more scattered and never run together occupy the whole area of the leaf. At Esbly plants of *Colchicum* grow in abundance among the orchises are never attacked; at Châlons-s Marne on the contrary the orchises are never attacked.

The leaves of *Orchis* on which *C. Ollivieri* is growing are frequen infected by the aecidium stage of *Puccinia Orchidearum-Phalaridis* Kleba

Perhaps the two species of *Cladochytrium* are only biological species resemble in this the rusts of the group of *Puccinia graminis* and *P. Rub vera*, and the species of *Peridermium*.

INSECT PESTS.

863 - **Occurrence of the Colorado Beetle (*Leptinotarsa decemlineata*) in many** (1). — *Illustrierte landwirtschaftliche Zeitung*, Year 34, No. 57, pp. 55 1 fig. Berlin, 1914.

The presence of the Colorado potato beetle (*Leptinotarsa decemlinea* which had not been seen in Germany since 1887, has been reported fr Hohenwedel near Stade (Hanover); the Government immediately orde the most drastic measures against this dangerous beetle.

(1) See also Nos. 2295 and 2360, *B.* July 1911.

Micrococcus nigrofaciens as Cause of an Infectious Disease of the Larvae of _Lachnosterna_ spp. in the United States and in Portorico. — NORTHRUP ZAE in *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part II, Vol. 41, No. 11-17, pp. 321-339, figs. 1-5, plates I-IV. Jena, 1914.

During the summer of 1912 specially severe injury to various crops to the white grubs of May or June beetles (*Lachnosterna* spp., *Scarabaeidae*) were reported from Michigan.

The appearance of these beetle larvae was accompanied by the manifestation of a bacterial disease characterized by the blackening of the parts their bodies affected. The cause of the infection is a species of *Micrococcus*, for the above reason named *M. nigrofaciens*. It was found under microscope in almost pure culture on agar plates inoculated from the ased part of a live larva. It is frequently associated with a gas-producing bacillus (*Bacillus septicus insectorum* of Krassilstschik ?), from ch it is separated with difficulty.

The *Micrococcus* lives in the soil and is present in many soils of Mi-gan, Illinois, Maryland, Northern Carolina, Portorico and very probably ther countries also. It grows well on the usual nutritive media, but ch better on the special media prepared with the larvae (gelatine, agar, th) and on the larvae themselves. It colours well with the usual water alcohol colours, and shows clearly the process of division; it is Gram-itive but not acid-fast.

The disease has been successfully reproduced in a healthy larva of *nosterna* by placing it on artificially infected soil and incising its integument.

The characteristic alteration was also caused in some healthy larvae nother beetle, *Allorhina nitida*, by placing them on soil soaked with er and sterilized, to which some broth containing the *Micrococcus* in pension was added. It seems as if in the individual larvae of the same us the power of resistance to the *Micrococcus* varies greatly. The ngest seem to be the most susceptible; the larvae of *Lachnosterna* n less resistant than those of *Allorhina*.

The micro-organism in question proved pathogenic to adults of *Periplaneta americana*; the disease followed its course as in the larvae of *Lachnosterna*; nevertheless the infection was apparently limited to the legs.

It has not been possible to determine whether the *Micrococcus* is thogenic for earthworms, nor have repeated attempts to isolate it from naturally infected soil succeeded.

Excessively moist soil favours the progress of the disease and this y be considered one of the chief factors in rendering the infection mortal.

In the soil there exist other organisms which may produce an infection the larvae. The above-mentioned gas-producing bacillus found in the ture plates appears in determined conditions to contribute to render disease mortal and it may be the first micro-organism to invade the ect.

The *Micrococcus* does not lose its virulence after having been culti-ed artificially for upwards of a year.

It has not yet been possible to try this micro-organism as a rem in the control of the larvae of *Lachnosterna*; this will, however, be d as soon as possible. The larvae of some *Lachnosterna*, commonly kn " caculo " or " gusano blanco " at Portorico, are there very injurious sugarcane: in order to experiment the *Micrococcus* against them, cultu have been sent to Rio Piedras and Mayaguez; no definite results h been obtained.

From the conclusive results obtained by inoculating and saturat the soil, the inference may be drawn that the *Micrococcus* may in future be usefully employed in the control of the larvae of *Lac sterna*, especially in conjunction with other parasitic diseases to wh the larvae are subject. Since this micro-organism has also the po of infecting the larvae of another genus (*Allorhina nitida*) and also a insects (*Periplaneta americana*), it seems to suggest the possibility of tending its use, applying it especially in the control of other injur larvae in the soil.

865 – **The Grass Moth *(Remigia repanda)*, a Pest of Sugarcane, Rice Paragrass in British Guiana** (1). — BODKIN, G. E., in *The Journal o Board of Agriculture of British Guiana*, Vol. VII, No. 4, pp. 171-177. Dem April 1914.

Remigia repanda is a member of the family *Noctuidae*, owing its habit of living on numerous grasses, and particularly paragrass (*Pani muticum*) it has been given the popular name of Grass Moth. In Br Guiana it has been a well-known pest for many years, though this is first account of its life-history published in the Colony.

On sugarcane, rice — with the rice caterpillar (*Laphygma fru perda*) — paragrass and other grasses throughout the coastlands this mo may be found all the year round, and at certain periods, particularly the occurrence of rain after prolonged drought, the larvae appear in v hordes completely destroying whole areas of the above crops. It al occurs in several of the interior districts.

In Trinidad it has recently occurred as a serious pest and it is a known as a pest in Jamaica. The following are the localities whe *R. repanda* has been recorded: Canada, Labrador, United States (Tex Florida), Mexico, Honduras, Costa Rica, Panama, Colombia, Venezue Guiana, Brazil, Argentina, Antilles (Cuba, where it has beea recorded *Hypericum*, San Domingo, Jamaica and Martinique).

Under normal conditions this insect is not responsible for any seri damage and may easily be controlled.

The various instars of the life-history of this insect in the Colo coincide with those which have been described by Dr. Dyar of the Uni States; his description is appended by the writer. The ova have no been observed on the food-plants in this colony. The complete life-cy occupies under normal circumstances from 26 to 31 days.

No actual parasites have so far been secured from this insect in B

(1) See also No. 803, *B.* Aug. 1914.

iuiana. The Coccinellid beetle *Megilla maculata* De Geer frequently on the young larvae, and the so-called Demerara Robin (*Leistes* ısis) will also feed on them.

n sugar estates the usual method employed when a slight attack s pest occurs is to pick them off the canes by hand and drop them uckets containing kerosene and water. When efficiently carried out ; an effective measure, but the application of dry powdered arsenate d would give just as satisfactory results and would prove cheaper. When it attacks rice in the nursery beds, flooding may be resorted described for the control of the rice caterpillar.

As regards paragrass, the value of the crop hardly guarantees the ation of control measures ; a field when badly attacked may be left e caterpillars enter the chrysalis stage and then burnt off to prevent r infestation.

A New Sugarcane Aphis *(Aphis bituberculata)* in Louisiana. — WIL-S, H. F., in *Entomological News*. Vol. XXV, No. 7, pp. 298-299, plate XIII. ladelphia, 1914.

The writer received in 1912 some specimens of an aphis which had found on *Saccharum officinarum* in Louisiana (Audubon Park, New ns). Not having been able to indentify it with any other aphis found garcane, he describes it as new to science under the name of *Aphis rcilata*.

Eelworms Injuring Hops in Bavaria. — WAGNER in *Praktische Blatter für Pflanzschutz*, Year XII, Part 6, pp. 66-68, 1 fig. Stuttgart, 1914.

In August 1913 the writer observed at Pörnbach in a well cultivated 3-year-old hop garden a few dozen plants near each other which pre-d a very stunted growth. The hops were quite withered and worthless. It has been ascertained that the mischief was due to the presence of orms—very probably *Tylenchus devastatrix* Kühn — on the rootlets. orms had not previously been observed at Pörnbach, even on other

Godara comalis, a Cabbage Moth, Attacking Turnips in Queensland. - JARVIS, E., in *The Queensland Agricultural Journal*, New Series, Vol. I, Part 6, p. 427-429, plate 62. Brisbane, 1914.

One of the least known cablage moths, *Godara comalis*, has recently fested a decided liking for turnips, the caterpillars feeding freely on eaves so as to leave only the skeleton.

This species is sometimes found in association with *Hellula undalis*, torius pest known as the cabbage webworm, which not only causes us damage to this vegetable, but is destructive at times to turnips other cultivated Crucifers.

With reference to control, prompt measures at the commencement of season are of the utmost importance, since destruction of the first brood oths will materially decrease the injurious action of succeeding gene-ns. Arsenical sprays are of little use against larvae well established

among the heart leaves of big cabbages, but should be effective appl to young plants or to the foliage of turnips.

The writer does not believe that this pest has hitherto been recor as attacking cabbage seed-beds, but if it should do so Bordeaux mixt sprayed upon seedlings whilst in the bed and when planted out sho act as a deterrent.

It is advisable to destroy carefully all weeds, especially of Crucifer plants, and any badly injured cabbages, and never to allow stumps w worthless leaves to remain in the field after the crop has been remov Such refuse should be put in a heap and burnt without delay. Cultivat between cabbages at a time when the larvae are in the pupal stage wo doubtless destroy many of them, and also improve the general condit of both crop and soil.

869 - The Rose Beetle ***(Adoretus vestitus)*** and the Injury it Causes in Samoan Islands. — FRIEDERICHS, E., in *Zeitschrift für wissenschaftliche Insekten kunde*, Vol. X, Part 2, pp. 41-47, figs. 1-6. Berlin-Schöneberg, 1914.

The writer gives a minute description of the larva, pupa and ima of *Adoretus vestitus* Boh., which is very abundant in the island of Up where it is called " Rosenkäfer " by the German colonists, as the per insect attacks by preference rose leaves, which it riddles completely. rose plants are often quite despoiled of their leaves and killed. The in feeds also on larger leaves such as those of cacao, and in a characteri manner, leaving only the outer edges and the ribs untouched. writer recently observed many young cacao plants in a plantat destroyed by *Adoretus*. Even large trees were seriously injured by th insects. Other frequent host plants are *Coffea liberica*, *Hibiscus tiliac* (" fau " of the Samoans; almost every plant has its leaves comple devoured), *Terminalia litoralis* (" talie " of the natives) and others.

The injury caused by these beetles, with the exception of that roses (which have no economic importance in Samoa), has not hitherto b very severe; the insect and the mischief that it does are, however, on increase and perhaps before long it may become dangerous.

The eggs of *Adoretus* are unknown to the writer. The larvae w fully developed are about eight-tenths of an inch in length; they are a yellowish white and are found at all times and of all sizes on the r of Gramineae and under rotting vegetable matter, especially in decompos farmyard manure, from which it may be inferred that the insect mu plies all the year round. Before pupating, the larvae rest for a long tim then they prepare, by means of a special secretion, a kind of cocoon earth which protects them from their enemies. The larvae do not inj the roots of plants. Probably the insect has been introduced into Samoan Islands (where it was first noticed about six years ago) in larval stage by means of vegetable matter surrounded by earth. adult insect is from 0.4 to 0.5 in. long; its colour varies from yellow to a brownish red. It lies hidden during the day and is therefore v rarely found; it feeds and mates at night. If disturbed it allows it to fall from the leaves. It appears in great numbers throughout the ye

t has been observed that it is always the small cacao trees not sheltered
r way which are killed by the insect, while those in the shade of other
or surrounded by bananas, for instance, often remain uninjured.
have been protected by mosquito curtains being thrown over them
ght and cacao nurseries might be equally protected by old fishing
Shaking the plants and collecting the adult insects has given only
il results, as new individuals keep on appearing. Spraying with
is substances has prevented the beetle from devouring the leaves,
hese have been damaged by the remedies used. Insectivorous birds
mmals ought to be introduced into Samoa to feed upon the larvae
soil. Hitherto the attempts to infect *Adoretus* with the green mus-
ie fungus (*Metarrhizium Anisopliae*), which has been recently used
moa with very promising results against the larvae of *Oryctes rhino-*
the worst enemy of cacao, have failed. The writer will continue
searches in this direction.

RUGGERI ALFREDO, *gerente responsabile.*